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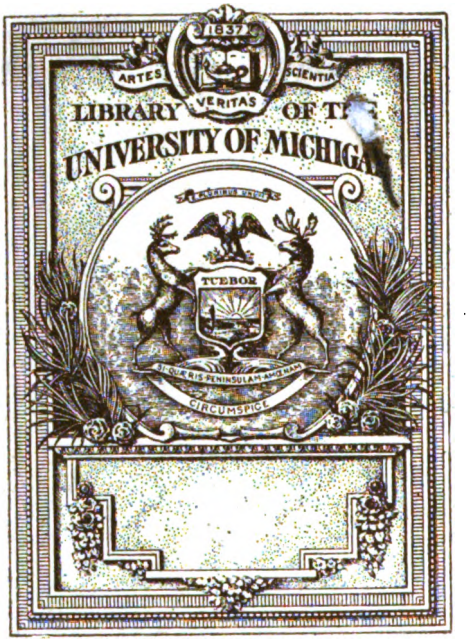

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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME VII

WITH 22 PLATES

1919

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY, EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

SUBSCRIPTION PRICE:
ONE DOLLAR PER YEAR SINGLE NUMBER TEN CENTS

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. VII JANUARY, 1919 No. 1

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BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL, AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING.

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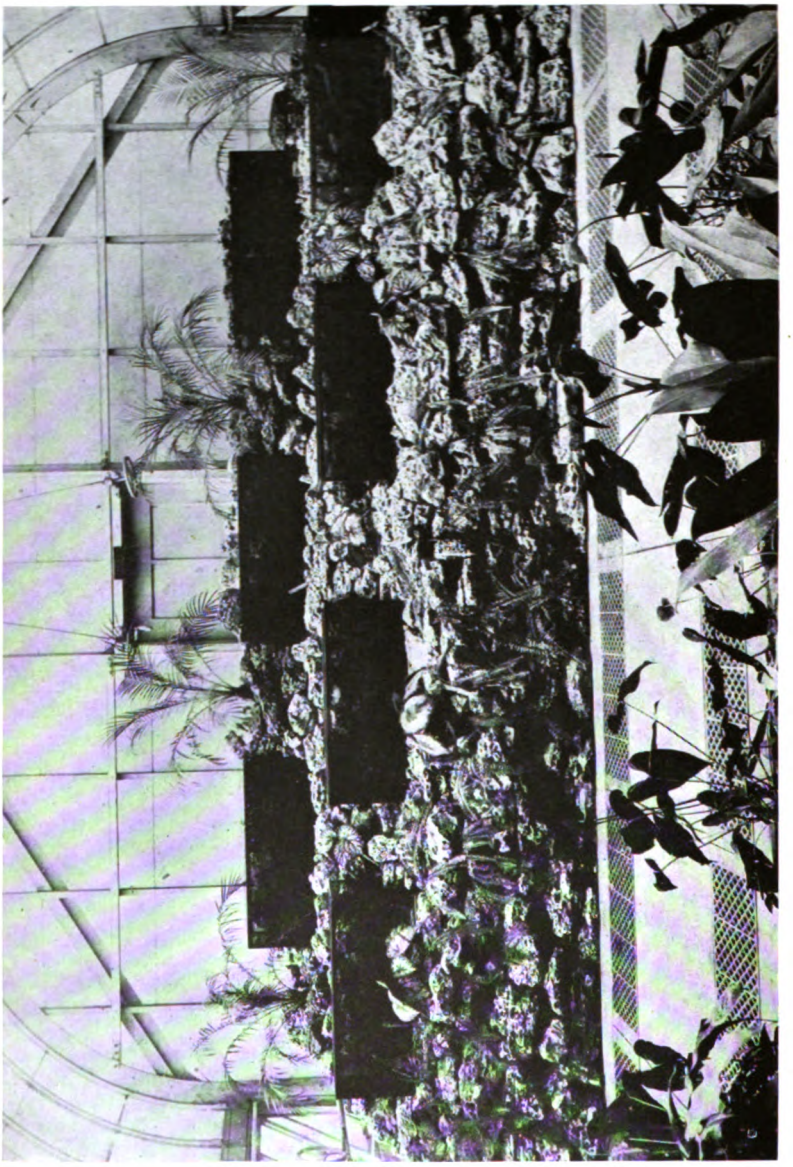

ONE OF THE ALCOVES CONTAINING AQUARIA.

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Missouri Botanical Garden Bulletin

Vol. VII St. Louis, Mo., June, 1919 No. 6

AQUARIUM EXHIBIT

Through the instrumentality of the St. Louis Aquarium Society, the Garden is fortunate in being able to establish a display of fancy fish, exhibited in specially prepared aquaria which have been installed in the alcoves of the aroid house. The attractive rockwork around the aquaria eliminates the artificiality generally associated with such displays. An additional feature of the exhibit is the use of various aquatic plants suitable for aquaria. Such plants are indispensable for maintaining the life of the fish, possessing the power of generating oxygen. Pure oxygen is essential for fish, while carbon dioxide is a plant necessity; thus a balance is maintained, the oxygen given off by the plants being utilized by the fish, while the carbon dioxide exhaled by the fish is absorbed by the plants. Without this reciprocal relation it is impossible to attempt fish culture successfully. It has been repeatedly demonstrated by specialists that aquaria containing sufficient plant life may be tightly covered, the plants giving off enough oxygen to support a proportionate number of fish. The feces excreted by the fish are absorbed by the plant roots as food.

The ornamental value of plants in aquaria is another important feature. The plants used may be either native or tropical, placing stress upon those which possess to the largest degree oxygen-generating properties. The best plants for this purpose are: pond-weed (*Potamogeton crispus*), fish-grass (*Cabomba caroliniana*), eel-grass (*Vallisneria spiralis*), water-weed (*Elodea canadensis*), and ribbon arrowhead (*Sagittaria subulata*).

Pond-weed (*Potamogeton crispus*).—A native of Europe, forming greenish brown growths. The leaves are lanceolate with undulated margins and the flowers white. One of the best oxygen generators, but an exceedingly noxious weed in outside ponds.

Fish-grass (*Cabomba caroliniana*).—A native of North America. The green leaves are produced in fan-shaped formation from the central stem which reaches a length of four

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feet. The plant is quite attractive, but is a rather poor oxygen generator.

Eel-grass (*Vallisneria spiralis*).—A grass-like plant native of North America, with strap-shaped leaves varying from one to three feet in length, light green in color, and translucent. The star-shaped, floating pistillate flowers are connected to the base of the plant by a long filament which later becomes spiral, submerging the flower for fertilization. The staminate flowers are globular, produced at the base of the plant, from which they break away, rising to the surface of the water. They float with the stream, pollen exposed, so that when contact occurs with the pistillate flowers, pollination readily takes place. This plant is a very good oxygen generator.

Water-weed (*Elodea canadensis var. gigantea*).—Native of North America, moss-like in growth. The leaves are in whorls upon light green stems which form strands reaching several feet in length. This is an excellent oxygen generator, growing completely submerged. It may become a pestiferous weed in lily ponds.

Ribbon arrowhead (*Sagittaria subulata*).—Native of North America. The submerged leaves are equitant, strap-shaped, dark green, one foot in length. The growth above water bears lance or sagittate leaves. This plant is one of the most valuable for aquarium purposes, multiplying rapidly by stoloniferous growths and supplying a plentiful amount of oxygen. A very noxious weed in ponds.

PLANTS SUITABLE FOR AQUARIA

Botanical name	Common name	Habit	Habitat
Aponogeton distachyus	Cape pond-weed	Floating	South Africa
Aponogeton fenestralis	Lace-leaf	Submerged	Madagascar
Azolla caroliniana	Water moss	Floating	North America
Cabomba caroliniana	Fish-grass	Submerged	North America
Callitriche verna	Spring starwort	Submerged or floating	North America
Ceratopteris thalictroides	Water fern	Leaves floating or above water	Tropics
Cryptocoryne Griffithii	Mosaic leaf	Submerged	Malaya
Cyperus alternifolius var. *variegatus*	Variegated umbrella plant	Leaves above water	Madagascar
Cyperus Papyrus	Egyptian pepper plant	Leaves above water	Egypt
Eichhornia speciosa	Water hyacinth	Floating	Southern United States
Elodea (*Anacharis*) *canadensis*	Water-weed	Submerged	North America
Eriocaulon septangulare	Hair grass	Submerged or above water	Southern United States

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Botanical name	Common name	Habit	Habitat
Fontinalis antipyretica	Willow moss	Submerged or above water	North America
Heteranthera limosa	Bog herb	Floating	North America
Hippuris vulgaris	Mare's tail	Submerged or above water	North America
Isoetes Engelmanni	Quillwort	Submerged	North America
Jussiaea longifolia	Primrose willow	Floating	Brazil
Lemna minor	Duck weed	Floating	North America
Limnobium Spongia	American frogbit	Floating	North America
Limnocharis Humboldtii	Water poppy	Floating	South America
Ludwigia Mulerttii	Water purslane	Floating	Amazon River
Myriophyllum proserpinacoides	Parrot's feather	Floating	Tropics
Nuphar sagittaefolium	Spatter-dock	Submerged or above water	North America
Pistia Stratiotes	Water lettuce	Floating	Tropics
Salvinia natans	Floating gem	Floating	Tropics
Potamogeton crispus	Pond-weed	Submerged	Europe
Sagittaria subulata	Ribbon arrowhead	Submerged or above water	North America
Trapa natans	Water chestnut	Floating	China
Utricularia vulgaris var. *americana*	Bladderwort	Submerged	North America
Vallisneria spiralis	Eel-grass	Submerged	North America

FISH TO BE FOUND IN AQUARIA

Among the curious fish from foreign lands will be seen the *Mollinesia latipinna*, or sail fish, with its huge, brilliantly colored dorsal fin which it expands like a sail when courting. These fish are natives of the bayous and small streams of the Gulf and particularly of Louisiana and Mexico.

The Mexican sword-tailed fish will be found in another tank, where it is readily distinguished by its long sabre-like tail. The colors of this fish baffle description.

The South American peacock-fish, one of the smallest known fish, while called the "millionfish" in its native waters on account of its vast numbers, is shown here in a small family, as, like the two above-named fishes, it is tropical in nature and requires much heat during the winter. It shows all colors of the rainbow and is covered with dots exactly like the eyes of the peacock's tail.

Another rare South American fish, the danio or zebra fish, resembling a miniature striped bass, will be found in several forms. It is incessantly active and scarcely ever stops for breath, taking its food in quick, snappy darts.

The paradise fish is another interesting variety, one of the earliest known aquarium fish. Its brothers, the fighting fish of Siam (*Betta pugnax* and *Betta rubra*), will be found near it. These latter fish are used for fighting by the Sia-

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mese, great fortunes and estates or women changing hands on the results of these singular battles. These fish are desperately pugnacious and will fight until one or the other is literally torn to pieces. The negro fish, the stilt fish, the ruby fish, and the albino fish will also be found in this collection. In another alcove will be found the sacred blue carp of Japan and the sacred red carp of the same country.

The East Indian and Japanese shubunkin, or brocaded goldfish, will be found in an alcove where are displayed Japanese lion-headed goldfish, Korean eggfish, Chinese moor (black) dragon-eyed goldfish, and the more beautiful forms of goldfish, such as butterfly-tails, lace-tails, fan-tails, and comet-tails, scaled and unscaled, in colors from gold to blue and mottled calicoes.

Among the wild native fish will be seen the rainbow darters, the sculpin or toad-fish, the various minnows and horn-pout, the red and common sunfish, the purple minnow, the rainbow dace, the striped dace, the common shiner, and the darters or top-water minnows with their wonderful checkerboard colors.

AQUARIUM MANAGEMENT

The chief sources of failure in the management of aquaria are overcrowding, overfeeding, sudden temperature changes, lack of proper plant life, and insufficient lighting.

The tendency to overcrowd aquaria is a common fault. A safe rule to follow is to allow one gallon of water to every one-inch fish; thus a ten-gallon aquarium may contain ten one-inch fish or two five-inch fish. When the fish continually come to the top and gasp for air it is a sign either of overcrowding or of the presence of some decomposed matter in the water.

Overfeeding of fish is an evil usually due to ignorance. Under natural conditions, in order to procure food, fish have to exert themselves, but as such exercise is not possible in a confined aquarium, food must be given in smaller amounts. No more should be given than can be consumed at once, and if any remains after five minutes it should be removed with a dip tube. When the temperature of the water is 60° F. or higher, daily feeding is permissible, but as the temperature goes down feeding should be reduced to two- or three-day intervals.

If change of water becomes necessary, sudden fluctuation of temperature should be avoided, as it is quite often the primary cause of disease. Every few days a tenth of the volume of water may be changed slowly. A sprinkling pot

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is desirable for adding water, the small streams becoming well aërated.

An evidence of sickness in fish is the dragging of the back fin which normally is carried upright. The movements also become sluggish and a tendency to hide in a dark corner is noticed. The body becomes thin, the fins split and are streaked with red, and the excrement shows a pale color. Sick fish should be removed quickly from the aquarium, and if the disease affecting it be contagious, the tank should be disinfected by adding three grains of potassium permanganate to a gallon of water, having previously removed the fish and the snails.

The mineral constituents of the water are absorbed by the fish and plants to such an extent as to necessitate addition of these materials at intervals. A mixture of three parts of evaporated sea salt to one part of Epsom salts added at the rate of one teaspoonful to twenty gallons of water every two weeks will prove beneficial. Acid conditions resulting in the crumbling of the shells of snails may be eliminated by keeping a piece of plaster of Paris or gypsum in the aquarium. In dissolving, it neutralizes the acid, but as it only dissolves under acid conditions there is no danger of the water becoming too alkaline.

In order to get rid of a good deal of decomposing matter in the aquarium, Japanese, African, and European red snails, as well as water mussels and weather-fish, are extremely useful and should find place in every tank. The mussels are necessary for keeping down algal growth.

Planting is done directly in sand which is spread to a thickness of one inch. Two inches of water is then added, the roots spread out, and another one-inch layer of sand and pebbles placed on top. The aquarium should be allowed to stand at least a day before the fish are added.

A globe is one of the worst possible containers for fish. When filled the air surface is small in proportion to the water bulk; the convex surface of the globe acts as a lens, focusing light into the eyes of the fish; proper plant growth is difficult, and in addition overcrowding and overfeeding are apt to result.

THE LINNEAN HOUSE

The Linnean House, which was erected by Mr. Shaw in 1882 to house the palm collection and part of the floral displays and is the only greenhouse remaining of those built by him, has been radically remodelled and presents a novel

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effect. To admit more light the old-fashioned, half-slate, half-glass roof has been replaced by a modern all-glass roof. Within the house the central feature is a rocky ledge from which a spring issues, emptying into a circular pool, the entire structure being surmounted by the overgrown rock and stump of a tree described in the April, 1919, number of the BULLETIN. *Lycopodium lucidulum* is growing in the cracks and crevices of the ledge. The banks on either side of the walk are planted with various conifers and ericaceous plants, the latter to produce effective masses of color at certain times of the year. The brick walls will eventually be covered with various species of ivy (Hedera), while the entrances will be arched by the foliage and brilliant orange flowers of the false holly (*Chorizema ilicifolium*).

Among the plants represented in this house are:

Andromeda calyculata
Andromeda floribunda
Andromeda japonica
Andromeda speciosa
Azalea amoena
Azalea Hinodigiri
Azalea indica var.
Azalea Kaempferi
Azalea ledifolia alba
Azalea yodogawa
Camellia japonica var.
Daphne Cneorum
Erica alba minor
Erica Alporti
Erica coccinea
Erica cuprea
Erica × Edward VII.
Erica Hammondi
Erica hypnoides
Erica melanthera
Erica monstrosa
Erica pilosa
Erica Serlici
Erica sericea
Erica stricta
Erica tenella
Erica Tetralix
Erica vagans
Erica vulgaris tomentosa
Erica vulgaris variegata
Kalmia latifolia (mountain laurel)
Lagerstroemia indica (crape myrtle)
Rhododendron hybrids

CONIFERS

Abies arizonica
Abies balsamea
Abies balsamea argentea
Abies concolor
Abies concolor lasiocarpa
Abies fraxoniana
Abies homolepis umbellata
Abies magnifica glauca
Abies nobilis glauca
Abies Nordmanniana
Abies pectinata
Abies pectinata pendula
Abies pectinata pyramidalis
Abies Pinsapo glauca
Abies sachalinensis
Abies sachalinensis nemoralis
Abies sibirica
Abies subalpina
Abies umbiculata
Abies Veitchii
Abies Veitchii olivacea
Abies "823 Purdom"
Araucaria imbricata
Cedrus atlantica
Cedrus Deodara
Cedrus Libani
Cephalotaxus drupacea
Chamaecyparis nutkaensis
Cryptomeria japonica aurea
Cupressus Lawsoniana
Cupressus Lawsoniana minima glauca
Cupressus Lawsoniana pyramidalis glauca
Cupressus Lawsoniana "Triomph von Boskoop"

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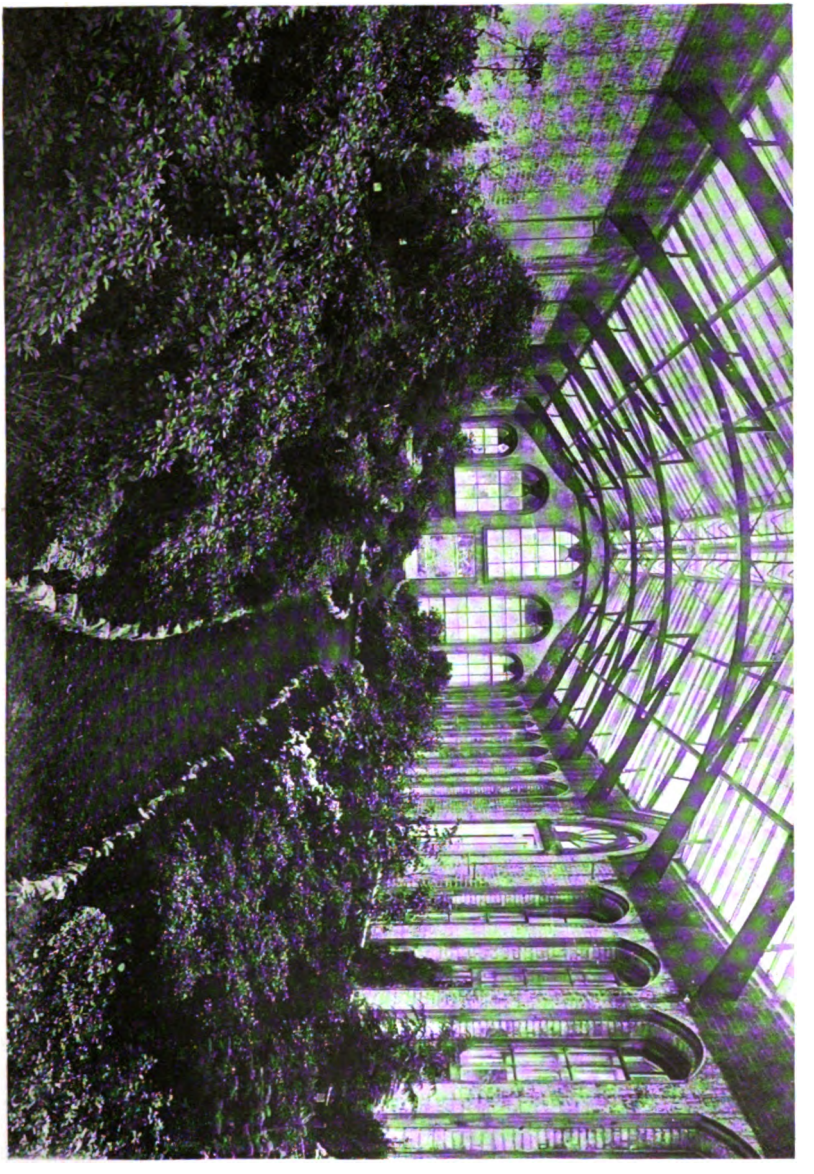

VIEW IN LINNEAN HOUSE.

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SPRING IN LINNEAN HOUSE.

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Juniperus canadensis
Juniperus canadensis aurea
Juniperus chinensis mascula
Juniperus chinensis pendula
Juniperus chinensis Pfitzeriana
Juniperus chinensis procumbens
Juniperus chinensis Sargentii
Juniperus communis aurea
Juniperus communis hibernica
Juniperus conferta
Juniperus japonica
Juniperus japonica nana aureo variegata
Juniperus macrocarpa
Juniperus nana canadensis
Juniperus Pinchoti
Juniperus recurva squamata
Juniperus Sabina
Juniperus Sabina prostrata
Juniperus Sabina tamariscifolia
Juniperus stricta
Juniperus sphaerica
Juniperus virginiana
Juniperus virginiana Cannartii
Juniperus virginiana elegantissima
Juniperus virginiana glauca
Juniperus virginiana globosa
Juniperus virginiana pendula
Juniperus virginiana Schottii
Larix europaea
Libocedrus decurrens
Picea alba
Picea Alcockiana
Picea Balfouriana
Picea canadensis
Picea coerulescens
Picea excelsa
Picea excelsa Gregoryana
Picea excelsa inversa
Picea excelsa Ohlendorffii
Picea Koyamai
Picea Meyeri
Picea nigra
Picea orientalis
Picea orientalis gracilis
Picea pungens
Picea pungens Kosteri
Picea "455 Schneider"
Pinus densiflora
Pinus Laricio austriaca
Pinus montana
Pinus Strobus
Pinus sucluensis
Pinus sylvestris
Pinus "8815 Wilson"
Pseudolarix Kaempferi
Pseudotsuga Douglassii
Retinispora leptoclada
Retinispora obtusa
Retinispora obtusa aurea Cripsi
Retinispora obtusa filicoides
Retinispora obtusa lycopodiodes
Retinispora obtusa nana
Retinispora obtusa nana aurea
Retinispora obtusa pygmea
Retinispora pisifera
Retinispora pisifera filifera
Retinispora pisifera plumosa
Retinispora pisifera squarrosa Veitchii
Sciadopitys verticillata
Sequoia gigantea
Taxus baccata
Taxus baccata fastigiata
Taxus baccata aureo-marginata
Taxus baccata repandens
Taxus cuspidata
Taxus cuspidata nana
Taxus cuspidata brevifolia
Thuya gigantea
Thuya occidentalis
Thuya occidentalis Douglassii aurea
Thuya occidentalis Ellwangeriana
Thuya occidentalis globosa
Thuya occidentalis Hoveyi
Thuya occidentalis lutea
Thuya occidentalis pyramidalis
Thuya occidentalis Rosenthalli
Thuya occidentalis spiralis
Thuya occidentalis Wareana
Thuya occidentalis Woodwardii
Thuya occidentalis Standishi
Thuya "7244 Wilson"
Thuya "7629 Wilson"
Thujopsis dolobrata
Tsuga canadensis
Tsuga canadensis Sargentii pendula
Tsuga Mertensiana

NOTES

At the commencement of Washington University, June 12, degrees were conferred on members of the graduate laboratory as follows: Doctor of Philosophy, Henry Schmitz; Master of Arts, Adele L. Grant, R. A. McGinty, Alexander Lurie, and R. W. Webb.

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Dr. George T. Moore, Director of the Garden, lectured before the Artists' Guild, May 3, on "Plants and People."

Dr. Norma E. Pfeiffer, of the University of North Dakota, has resumed at the Garden her monographic study of the genus Isoetes.

On the evening of June 5, before the cereal pathologists, Dr. B. M. Duggar, Physiologist to the Garden, presented the first paper on the subject, "Disease Resistance in Plants: Immunity."

Dr. B. M. Duggar, Physiologist to the Garden, spoke before the members' conference of the Chamber of Commerce, June 11, on "Why an Art-in-Industry Exhibition in St. Louis is Indispensable."

Mr. G. H. Pring, Floriculturist to the Garden, published an article in the June issue of the Gardeners' Chronicle of America on "Orchids of the Missouri Botanical Garden" and also contributed a paper to the May issue of Aquatic Life on "Aquatic Plants and Their Cultivation."

The first session of the St. Louis Conference of Cereal Pathologists was held in the graduate lecture room, June 5, following a buffet luncheon served by the Garden. Dr. George T. Moore, Director of the Garden, outlined the history and work of the Garden. The luncheon was preceded by a brief discussion in the graduate laboratory—led by Dr. Duggar and assisted by all graduates—of the investigations in progress by members of the staff, research fellows, and other investigators.

Recent visitors to the Garden include Dr. P. J. O'Gara, director department of agricultural and smelter by-product investigations, American Smelting and Refining Co., Salt Lake City, June 11; Mr. Edgar M. Ledyard, director agricultural department, United States Smelting, Refining and Mining Co., Salt Lake City; Prof. Kingo Miyabe, of the Hokkaido Imperial University, Sapporo, Japan, June 18-19; Baron Henry d'Anchald, member of the Academy of Agriculture of France, June 24.

Volume VI, Number 2, of the Annals of the Missouri Botanical Garden has been issued recently with the following contents:

"Studies in the Physiology of the Fungi. VI. The Relation of Bacteria to Cellulose Fermentation Induced by Fungi, with Special Reference to the Decay of Wood." Henry Schmitz.

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"Studies in the Physiology of the Fungi. VII. Growth of Wood-Destroying Fungi on Liquid Media." S. M. Zeller, Henry Schmitz, and B. M. Duggar.

"Merulius in North America, Supplementary Notes." E. A. Burt.

"Seed Disinfection for Pure Culture Work." H. C. Young.

"Seed Disinfection for Pure Culture Work: The Use of Hypochlorites." B. M. Duggar and Anne W. Davis.

STATISTICAL INFORMATION FOR MAY, 1919

GARDEN ATTENDANCE:

Total number of visitors	15,100

PLANT ACCESSIONS:

Total number of packets of seeds received in exchange	6
Total number of plants received in exchange	9
Total number of plants and seeds received as gifts	97

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	5
Total number of books and pamphlets donated	159

HERBARIUM ACCESSIONS:

By Purchase —

Miss Edith I. Watt—Private herbarium of the late D. A. Watt, consisting primarily of ferns and fern allies, estimated at	10,700

By Gift —

Dr. H. W. Anderson—*Peniophora quercina*	1
Joseph R. Bohr—Undetermined plant from Michigan	1
Dr. W. A. Murrill—*Septobasidium cirratum* Burt from Bahamas	1
Dr. L. O. Overholts—Fungi from New Hampshire and Pennsylvania	23
S. B. Parish—Plants of California	87
Dr. H. von Schrenk—Fungi on railway ties from Norfolk, Virginia	2
Dr. J. R. Weir—Fungi from Cuba	2
Dr. F. A. Wolf—*Protocaranospora nigricans* Atk. & Edg.	1

By Exchange —

J. A. Drushel—Plants of the United States	10
Caroline C. Haynes—Hepaticae from eastern United States	29
Ralph Hoffmann—Plants of Massachusetts, Wisconsin, and Missouri	1,002
New York Botanical Garden—Plants of Colombia, collected by H. H. Rusby and F. W. Pennell	170
TOTAL	12,029

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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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ST. LOUIS, MO.
1919

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HENRY L. WOLFNER,
President of the Board of Education of St. Louis.

DANIEL S. TUTTLE,
Bishop of the Diocese of Missouri

CHARLES A. ROE, Secretary.

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. VII SEPTEMBER, 1919 No. 7

VIEWS OF GARDEN

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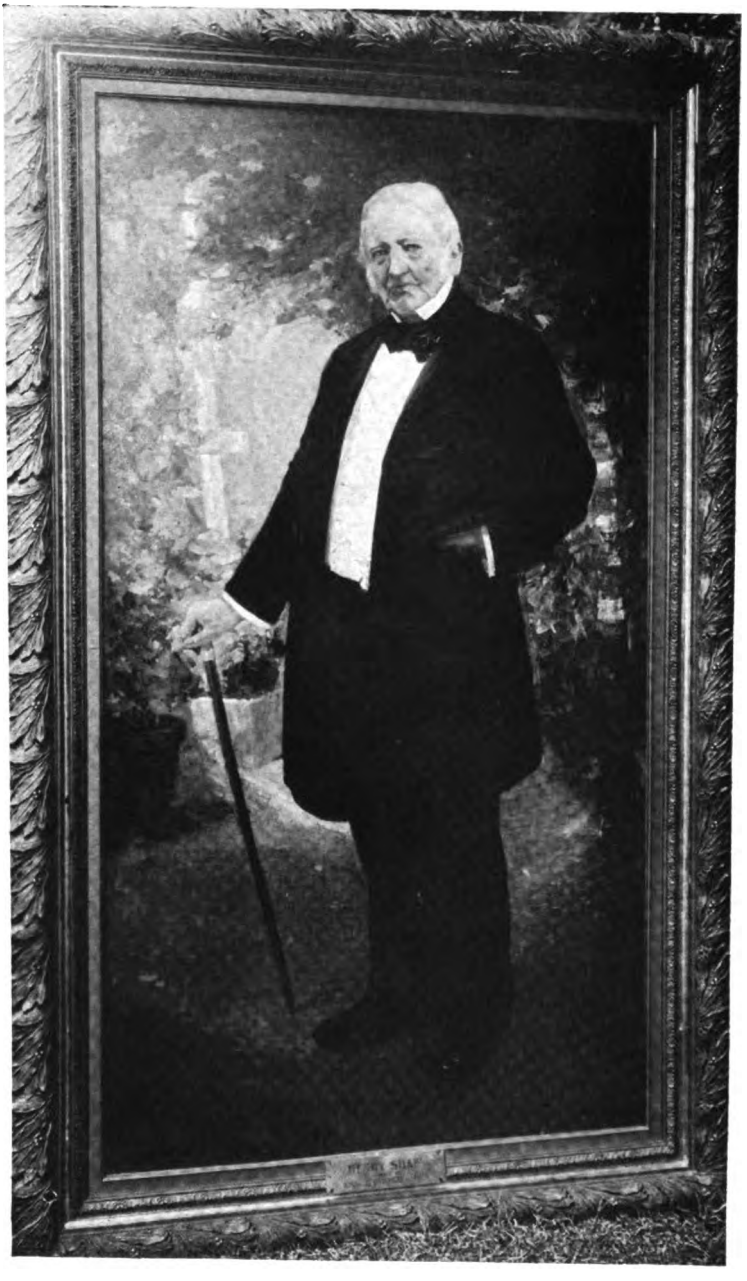

HENRY SHAW
Reproduction of painting by Richard Miller

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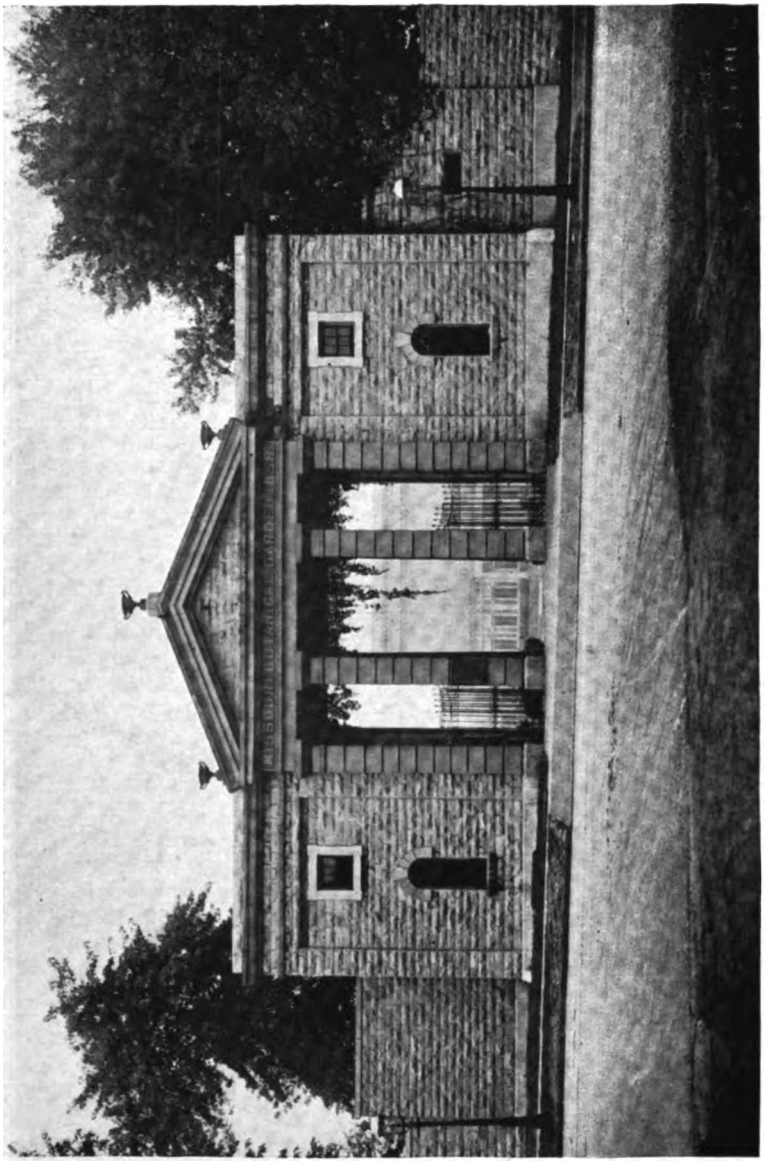

VIEW OF MAIN ENTRANCE FROM EXTERIOR, ERECTED 1858

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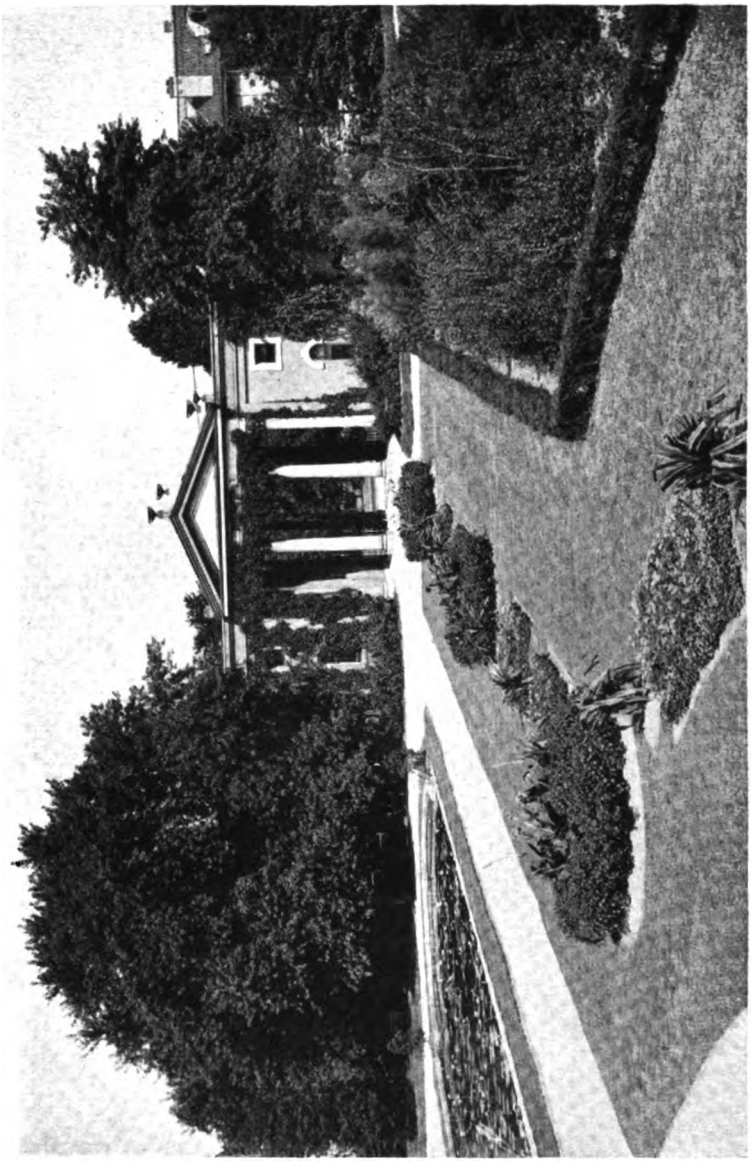

VIEW OF MAIN ENTRANCE FROM INTERIOR

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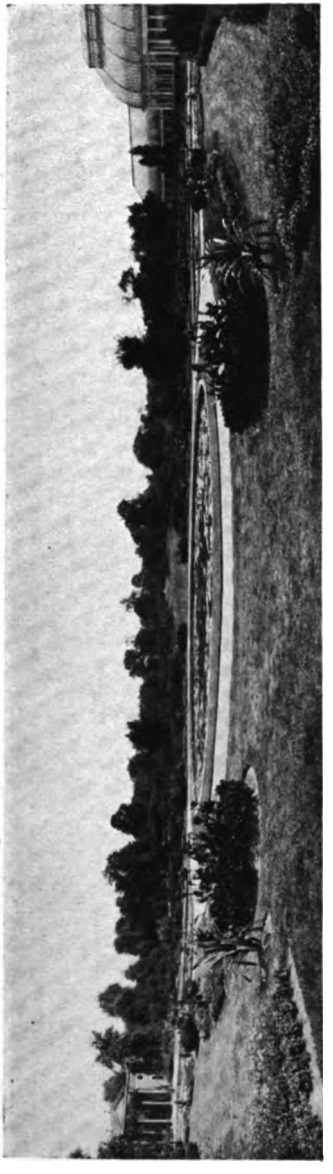
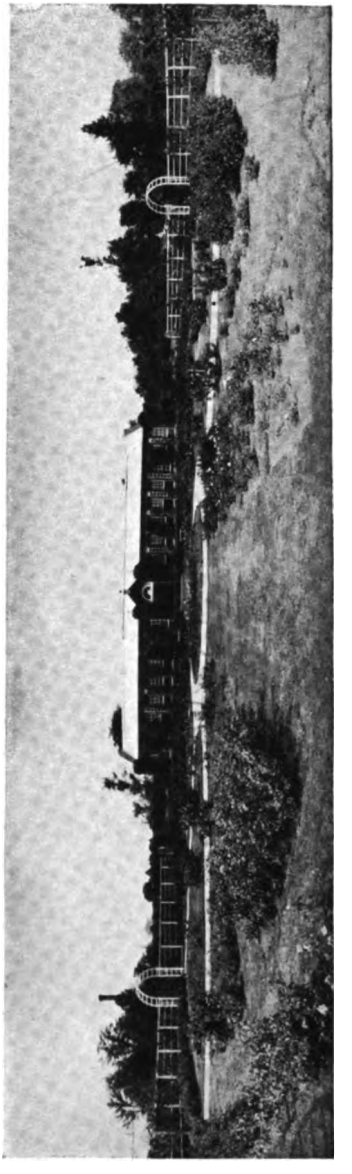


Looking south across knolls to mausoleum



Looking north across rose garden to Linnean House

TWO VIEWS OF GARDEN TAKEN FROM SAME SPOT

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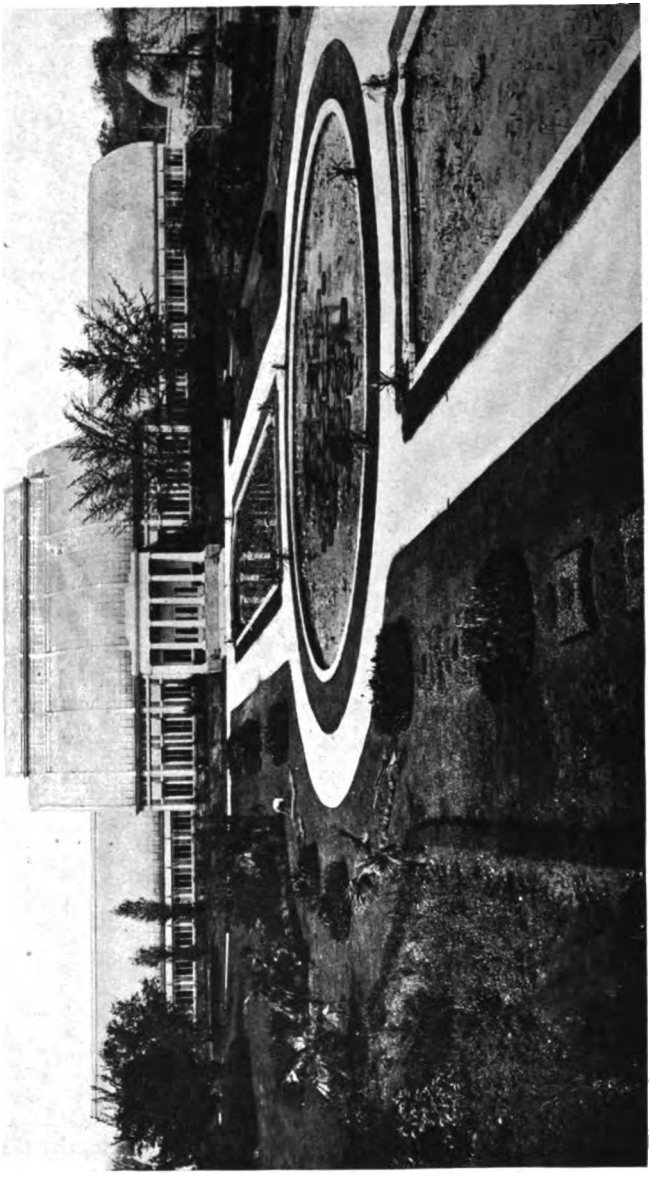

TROPICAL LILY POOLS AND MAIN CONSERVATORY. ERECTED 1912-13

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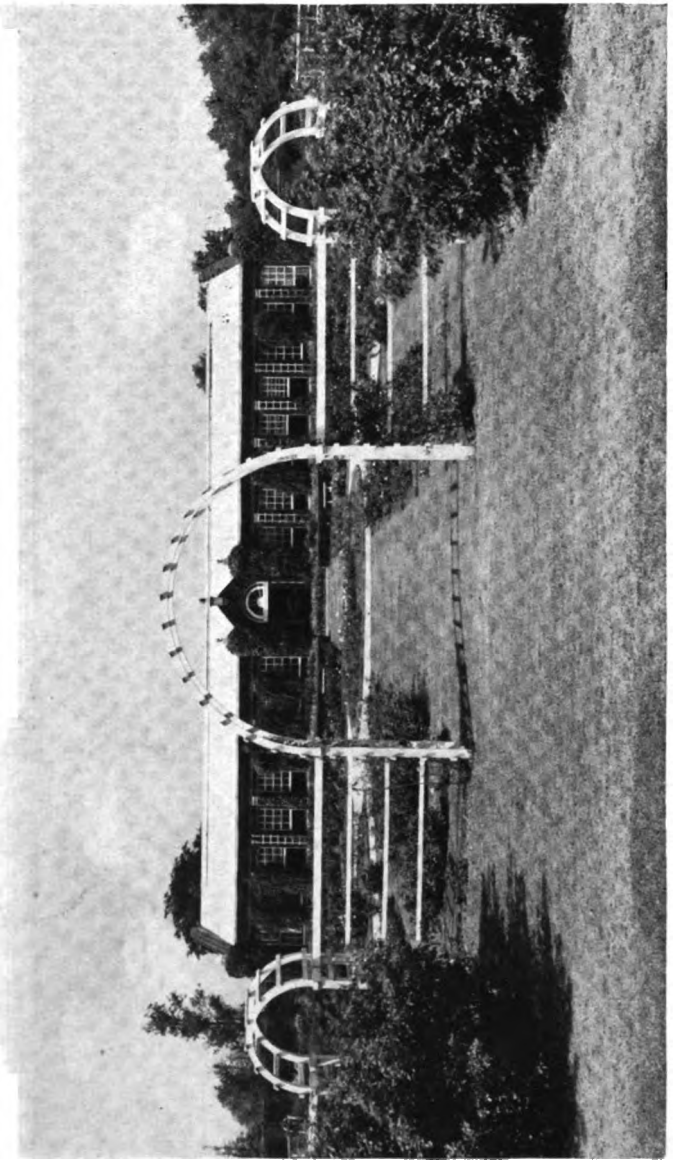

ROSE GARDEN LOOKING TOWARD LINNEAN HOUSE

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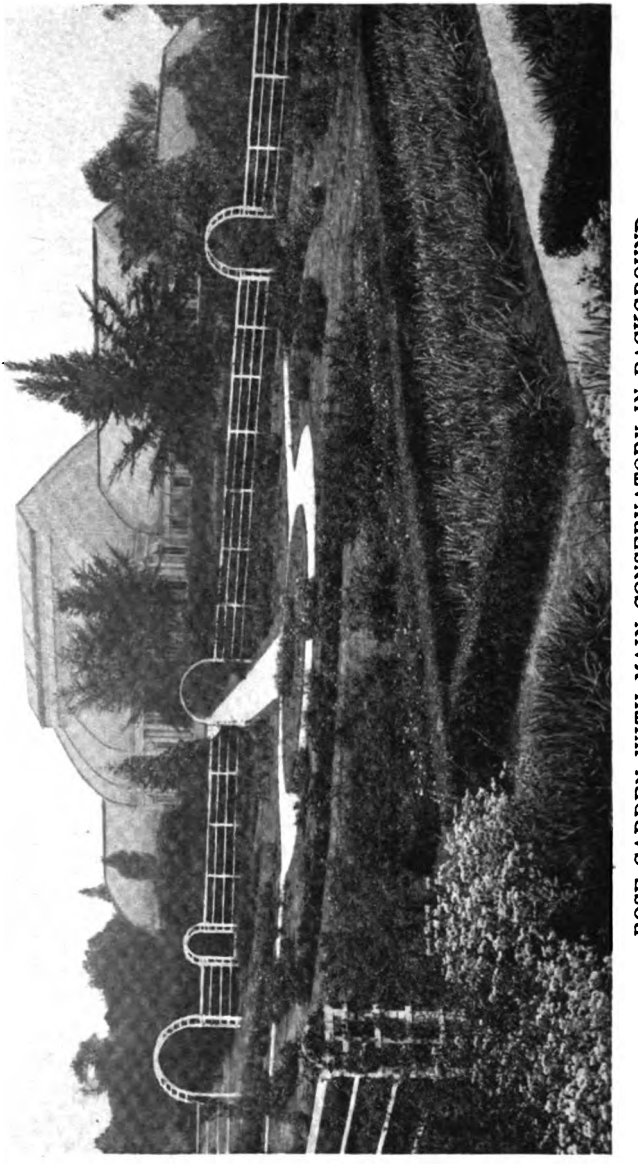

ROSE GARDEN WITH MAIN CONSERVATORY IN BACKGROUND

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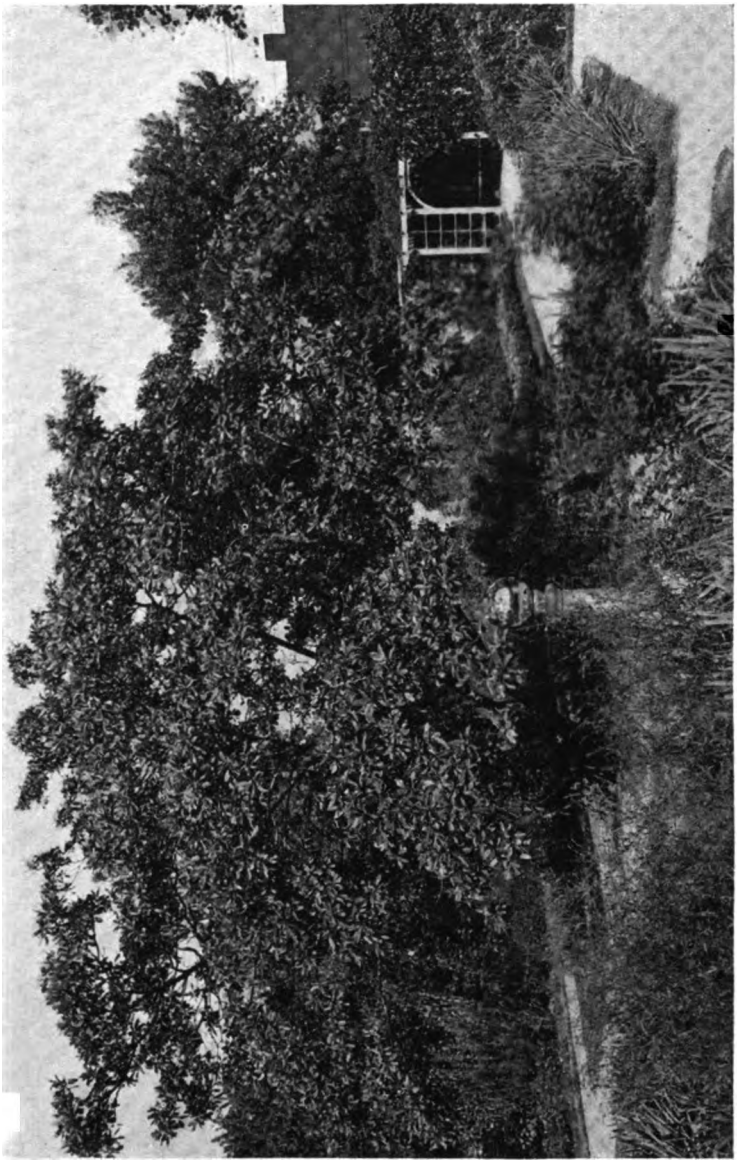

CORNER OF PERENNIAL GARDEN—GAZING GLOBE AND MAGNOLIA TREE IN FOREGROUND

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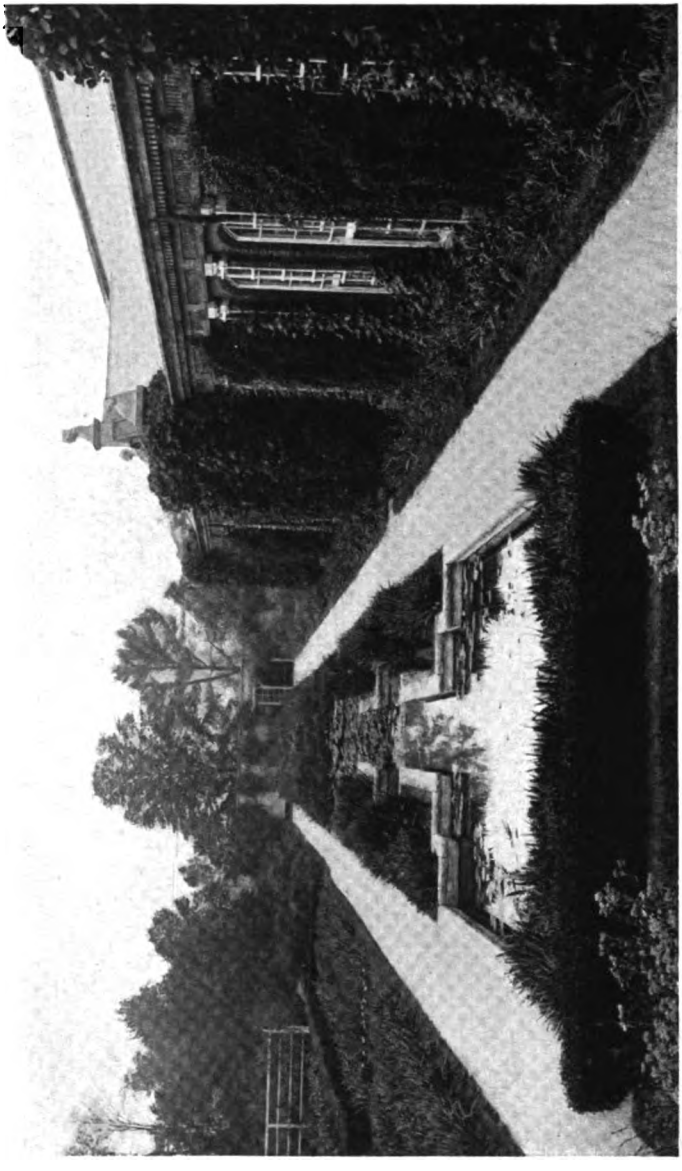

PERENNIAL GARDEN SHOWING LOTUS POOLS

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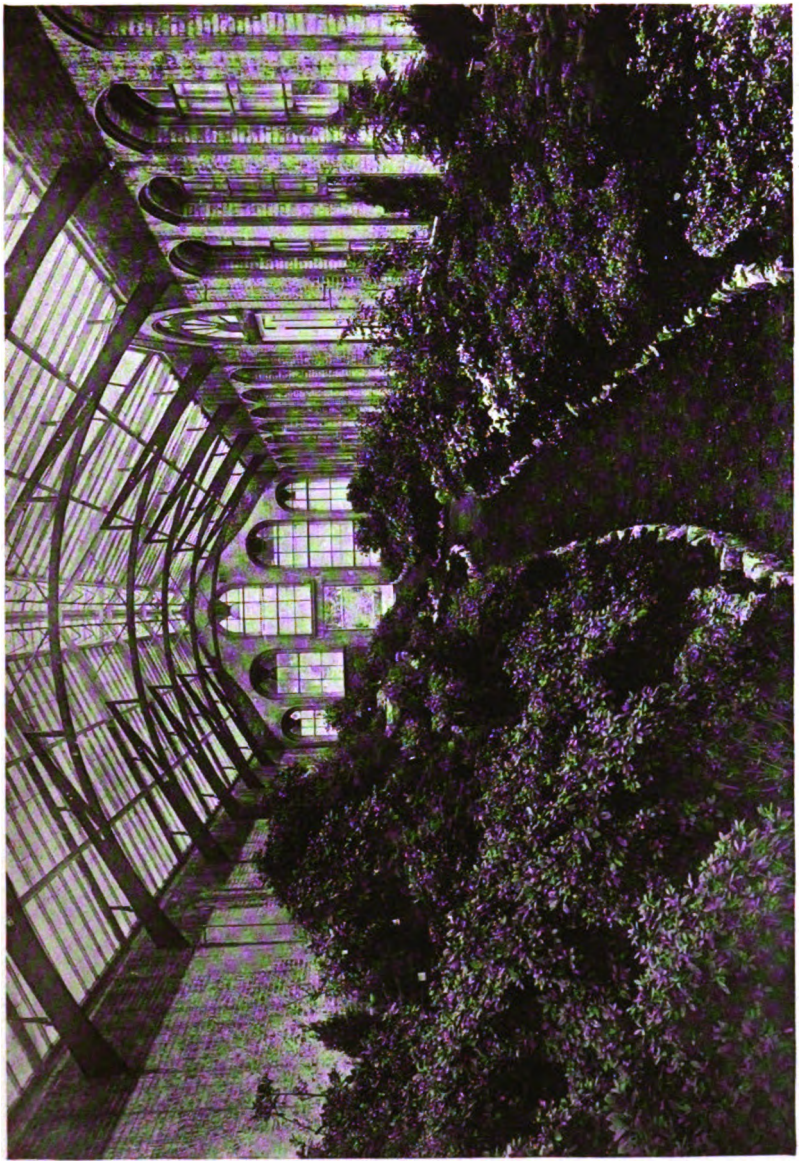

INTERIOR OF LINNEAN HOUSE. ERECTED BY HENRY SHAW IN 1883

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FRUITING BANANA TREE IN FLORAL DISPLAY HOUSE

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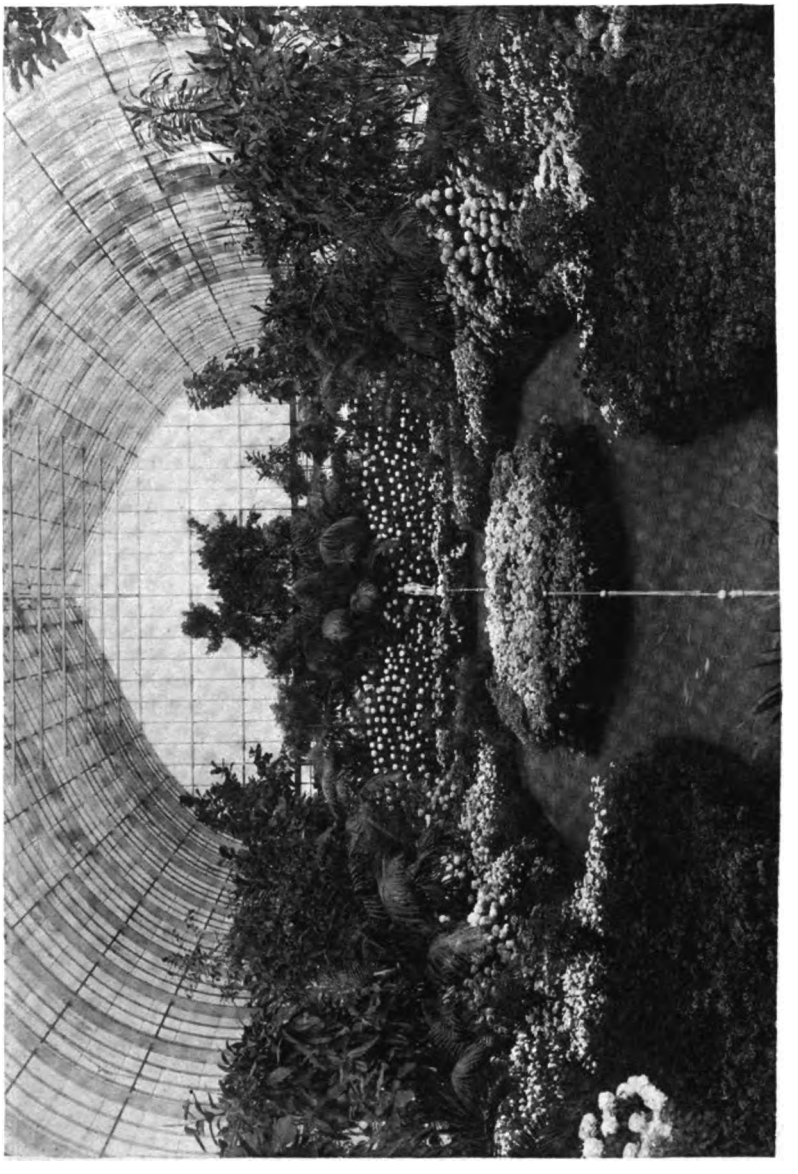

CHRYSANTHEMUM SHOW IN FLORAL DISPLAY HOUSE

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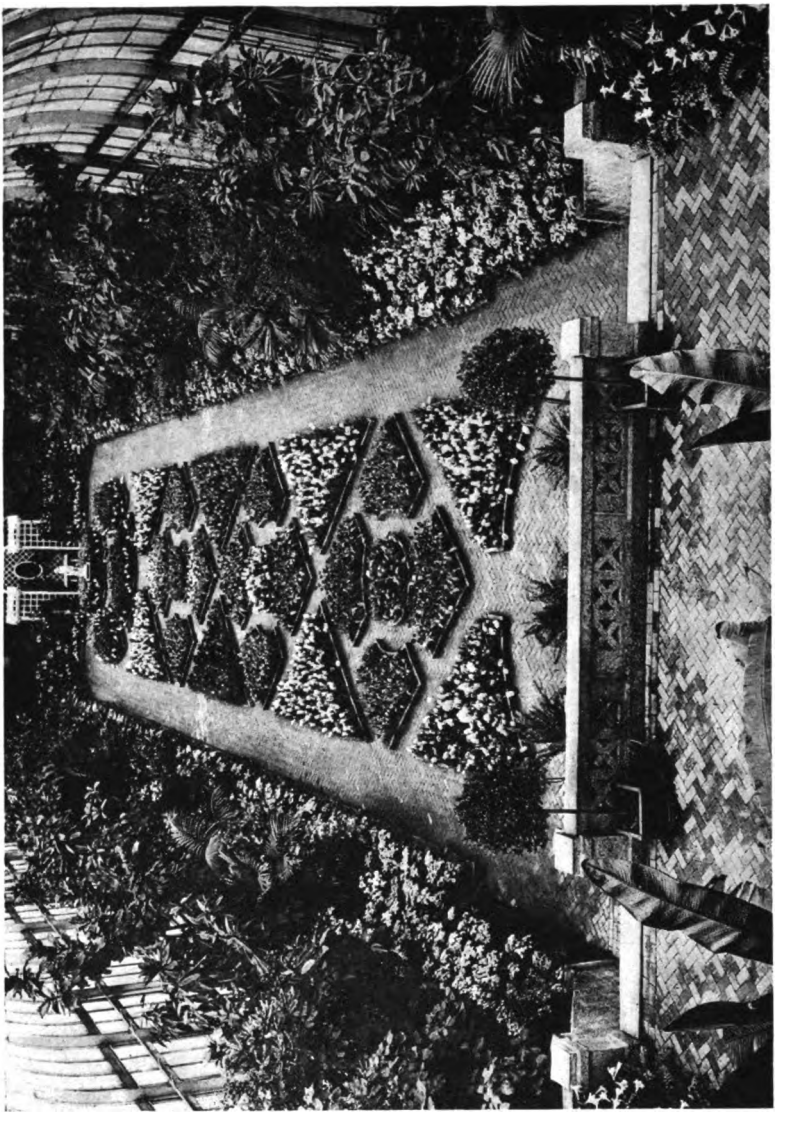

BULB SHOW IN FLORAL DISPLAY HOUSE

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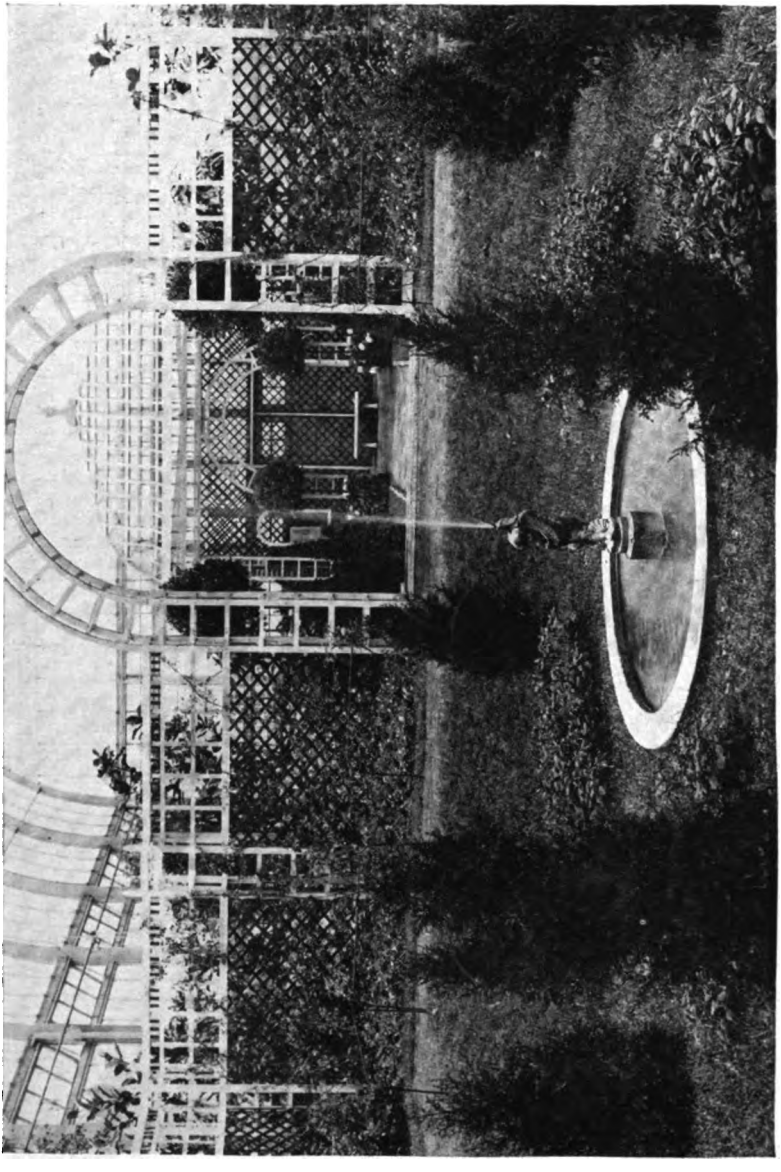

TRELLISED GARDEN ILLUSTRATIVE OF SHAKESPEARE'S TIME, SHOWN IN FLORAL DISPLAY HOUSE DURING SHAKESPEAREAN TRICENTENARY

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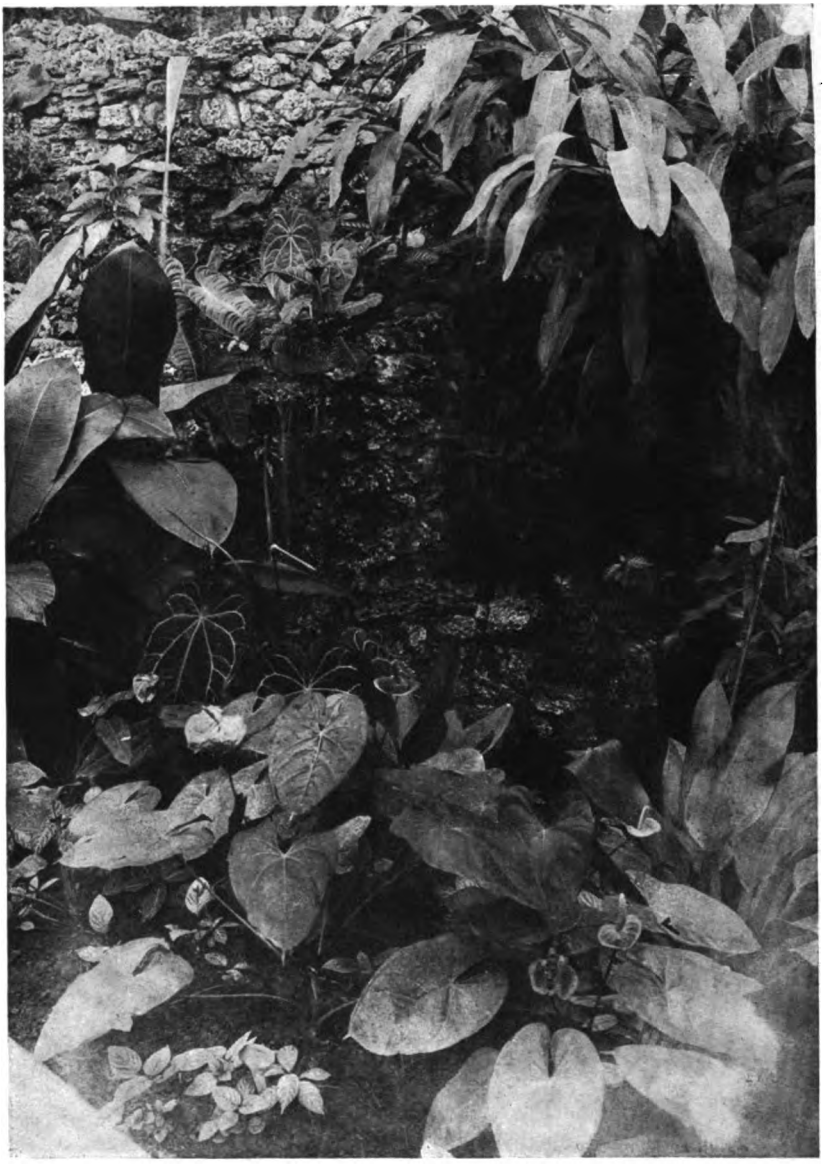

ROCKERY IN AROID HOUSE

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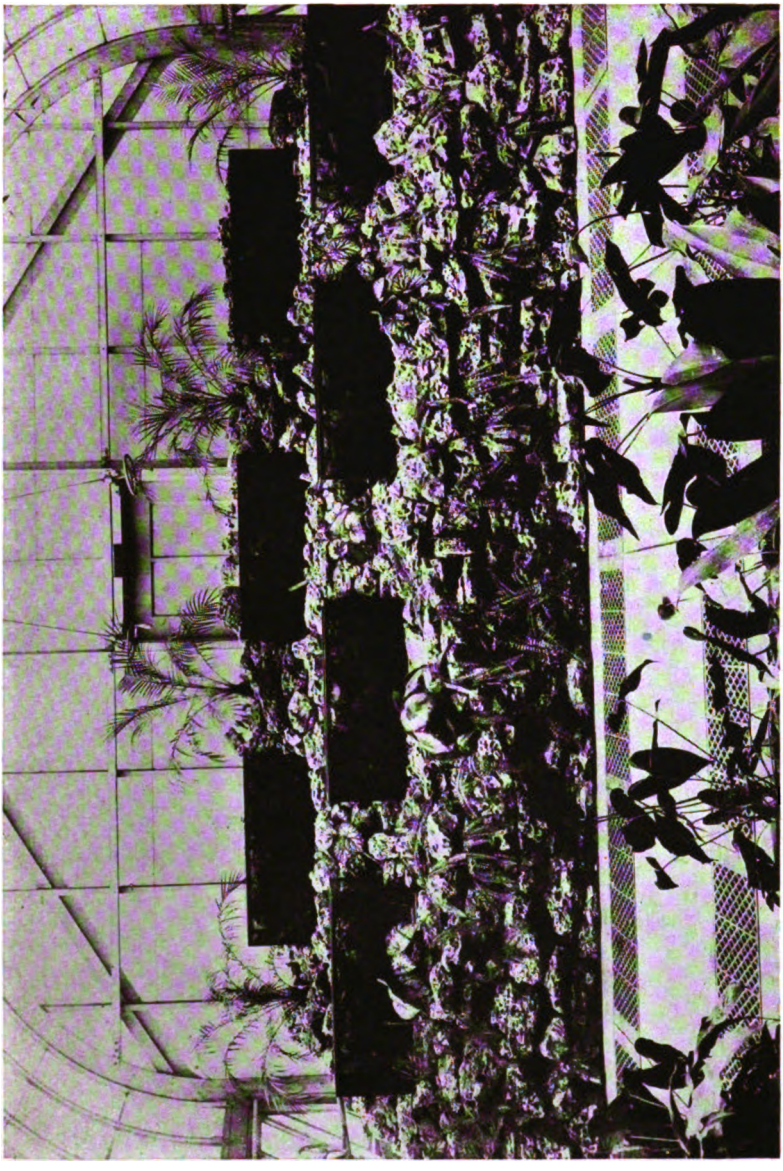

AROID HOUSE. ONE OF THE ALCOVES CONTAINING AQUARIA

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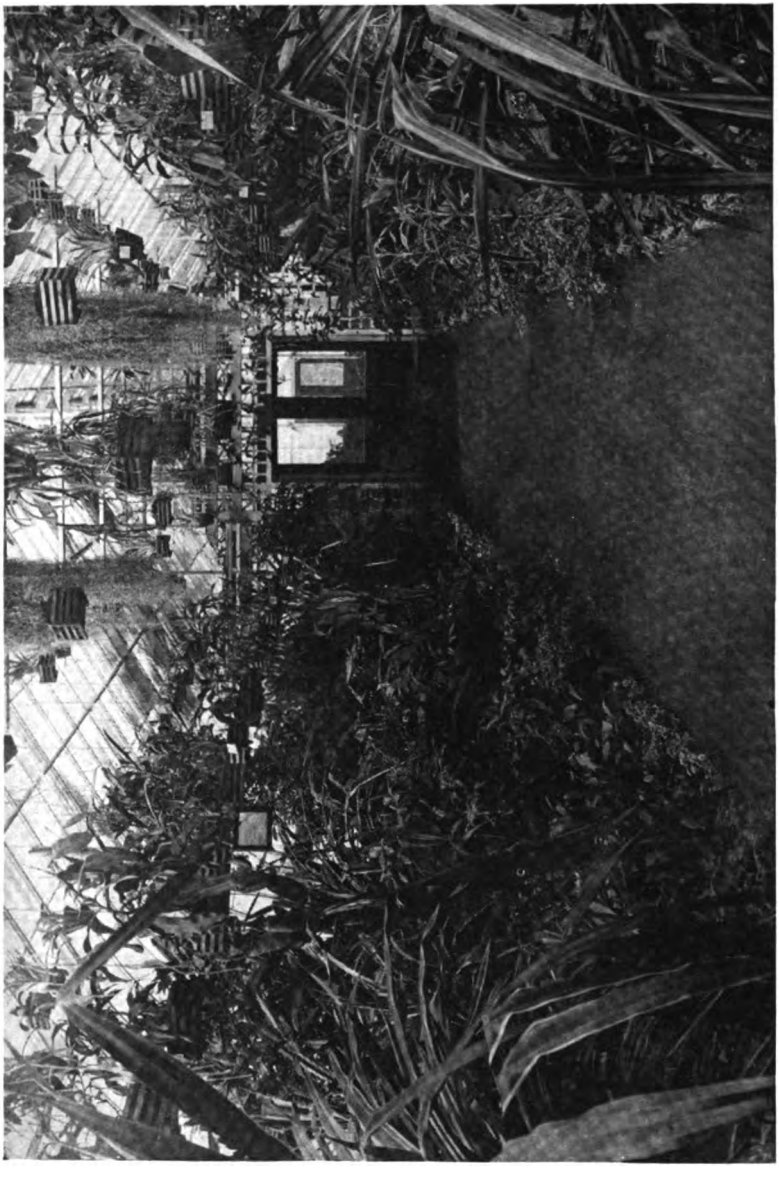

BROMELIAD HOUSE SHOWING VANILLA PLANT ON TRELLIS IN REAR

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GOOSE OR PELICAN PLANT IN BROMELIAD HOUSE

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ONE OF THE ORCHID-GROWING HOUSES

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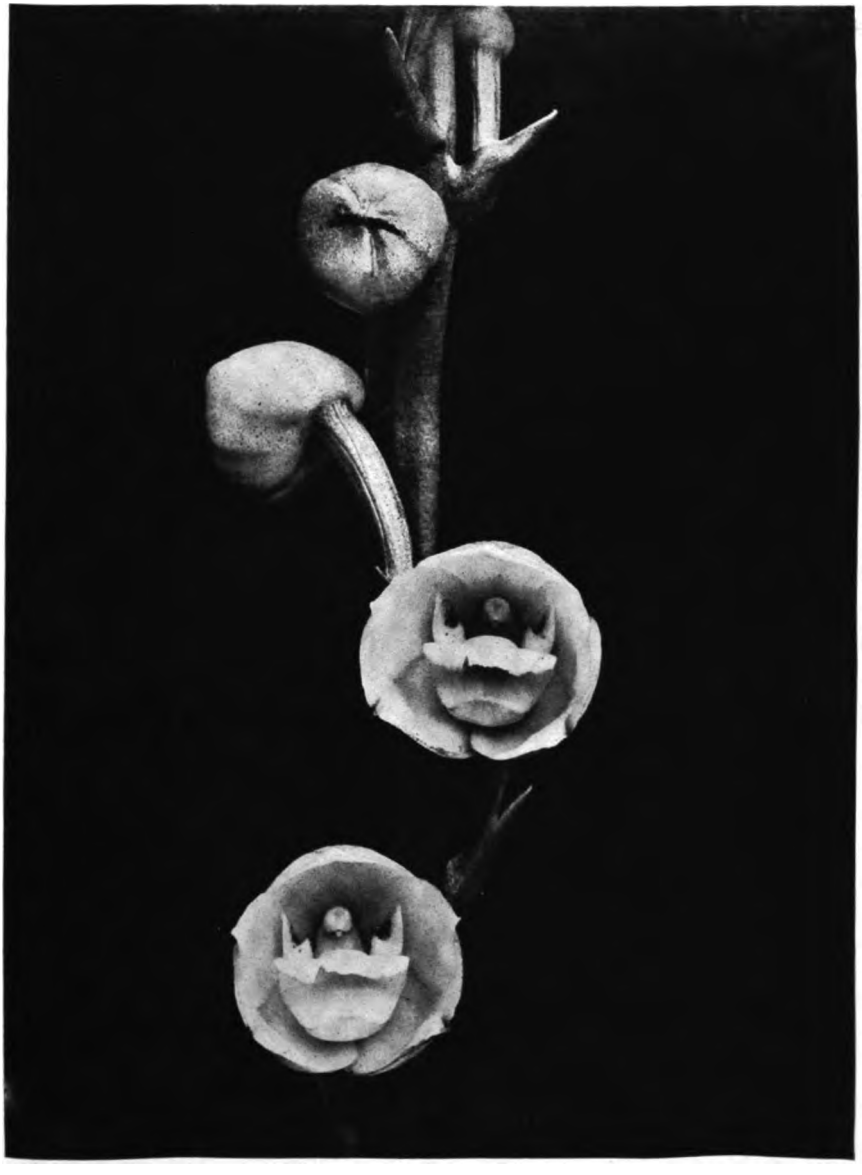

DOVE ORCHID (PERISTERIA ELATA)

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MAIDENHAIR TREE (GINKGO BILOBA). NATIVE OF CHINA

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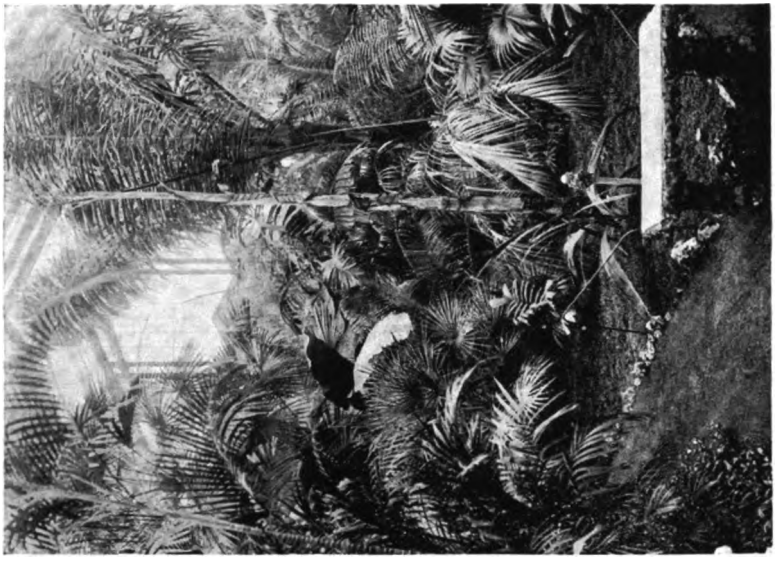

INTERIOR OF PALM HOUSE

EXTERIOR OF PALM HOUSE

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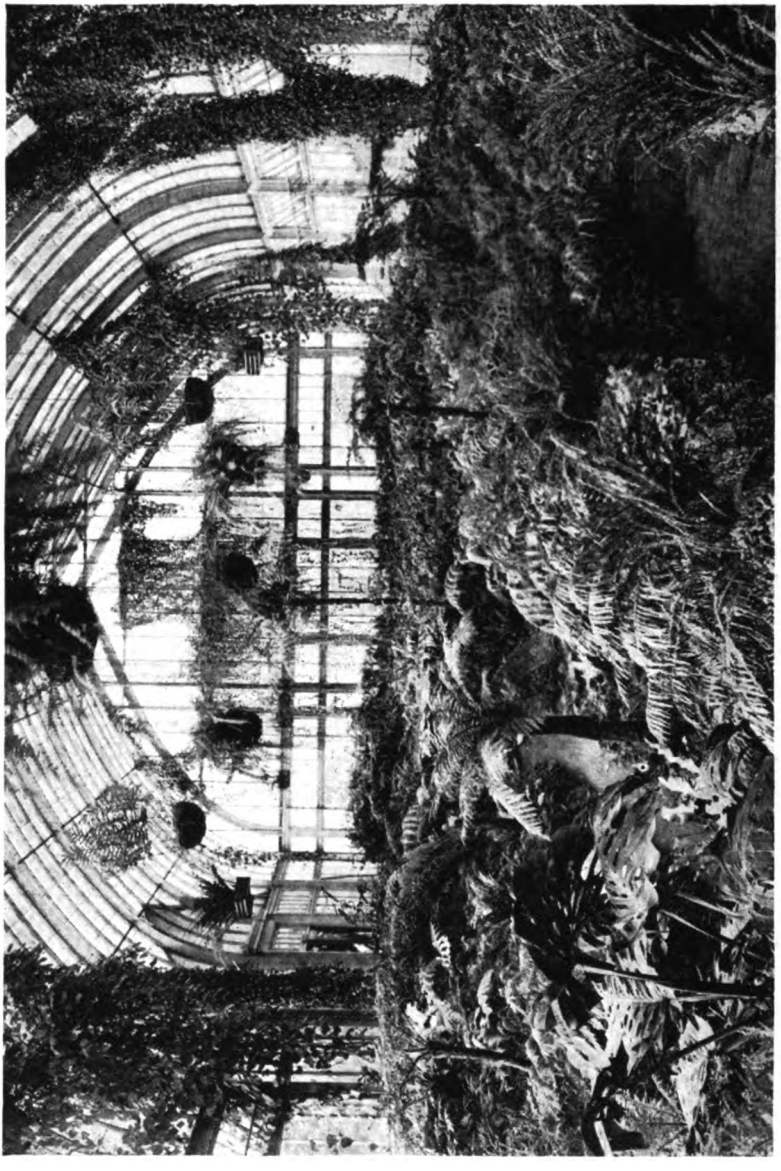

INTERIOR OF FERN HOUSE

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BRIDGE AND GROTTO IN FERN HOUSE

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INTERIOR OF CYCAD HOUSE

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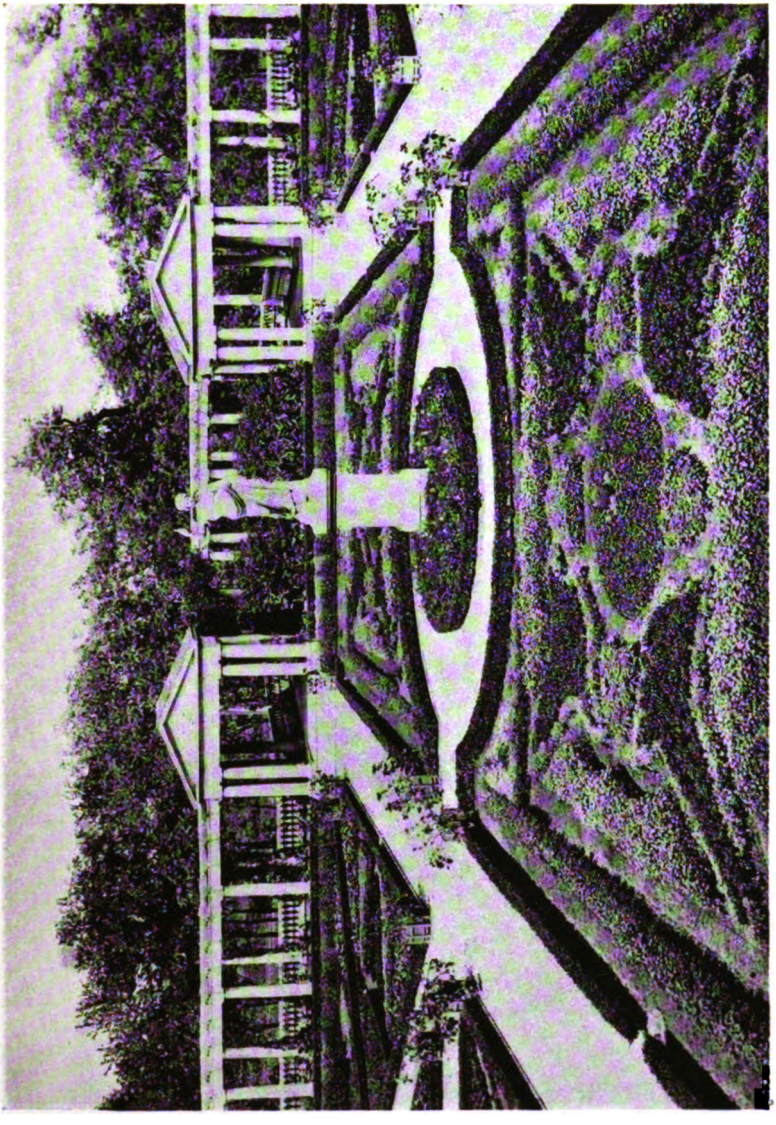

CENTRAL PANEL OF ITALIAN GARDEN SHOWING PERGOLA

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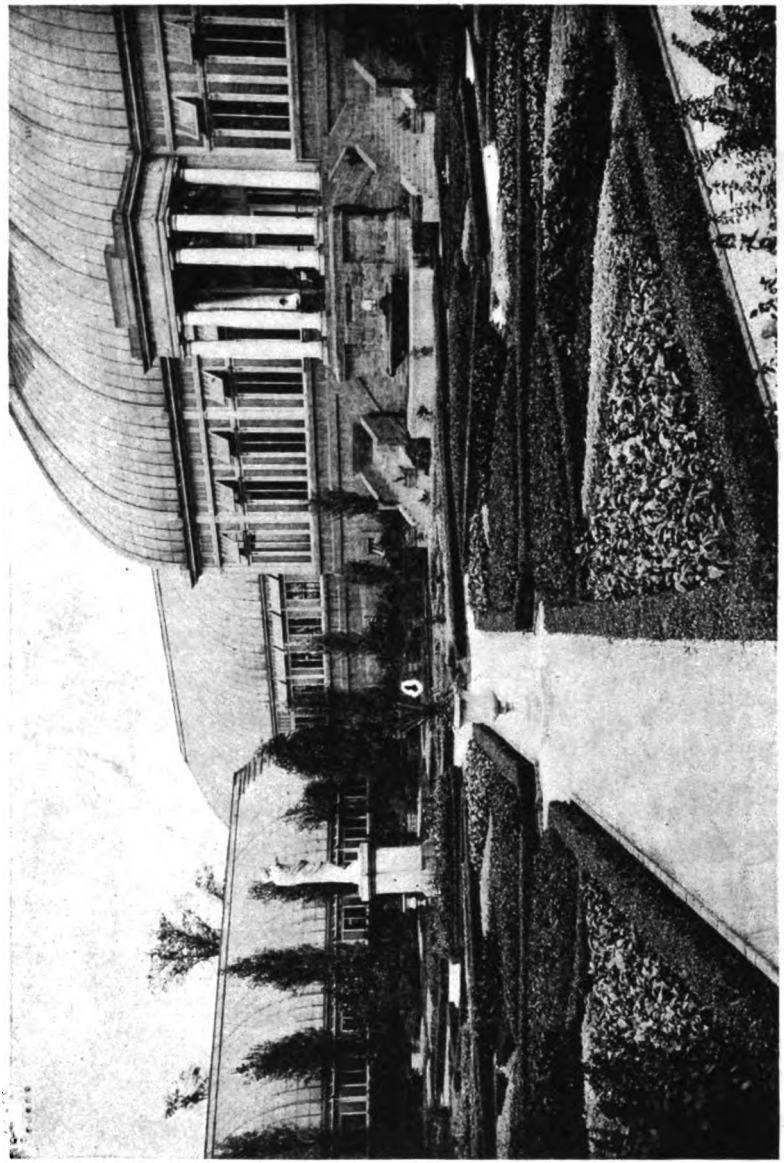

ITALIAN GARDEN LOOKING TOWARD CONSERVATORIES

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STATUE OF JUNO IN CENTER OF ITALIAN GARDEN. PURCHASED BY HENRY SHAW IN 1886. (COPY OF AN ANTIQUE NOW IN NATIONAL MUSEUM, NAPLES)

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INTERIOR OF SUCCULENT HOUSE

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INTERIOR OF ECONOMIC HOUSE SHOWING FRUITING PAPAYA IN BACKGROUND

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ECONOMIC HOUSE. COFFEE TREE IN BLOOM

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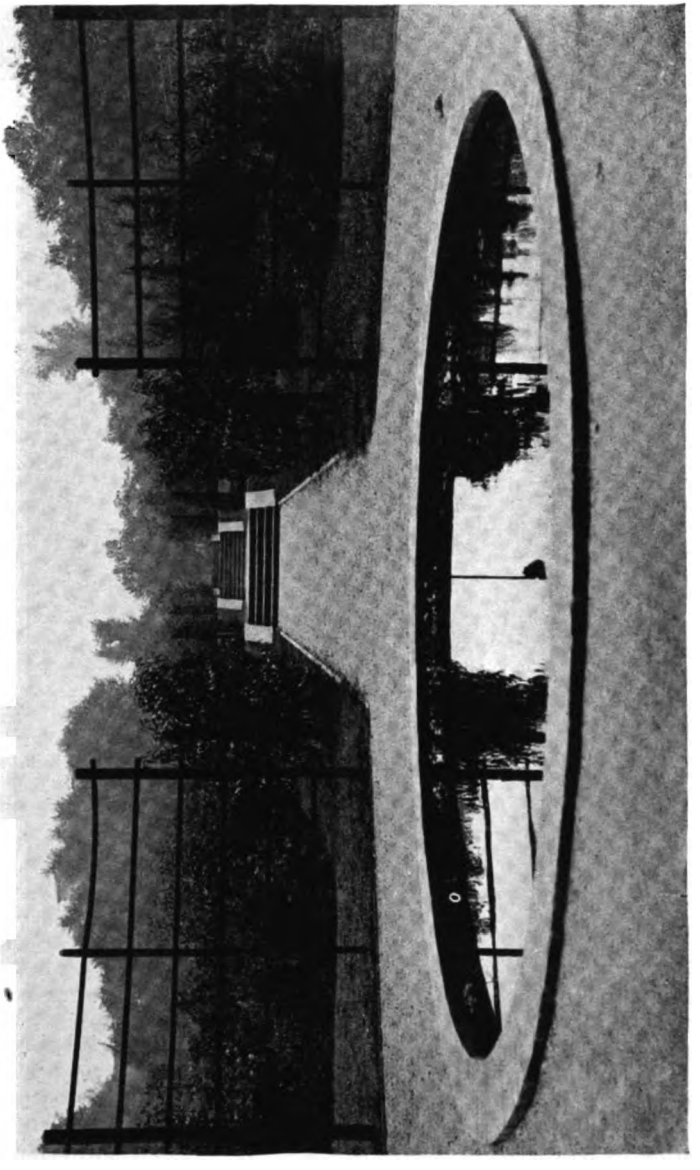

CENTRAL PATH THROUGH ECONOMIC GARDEN

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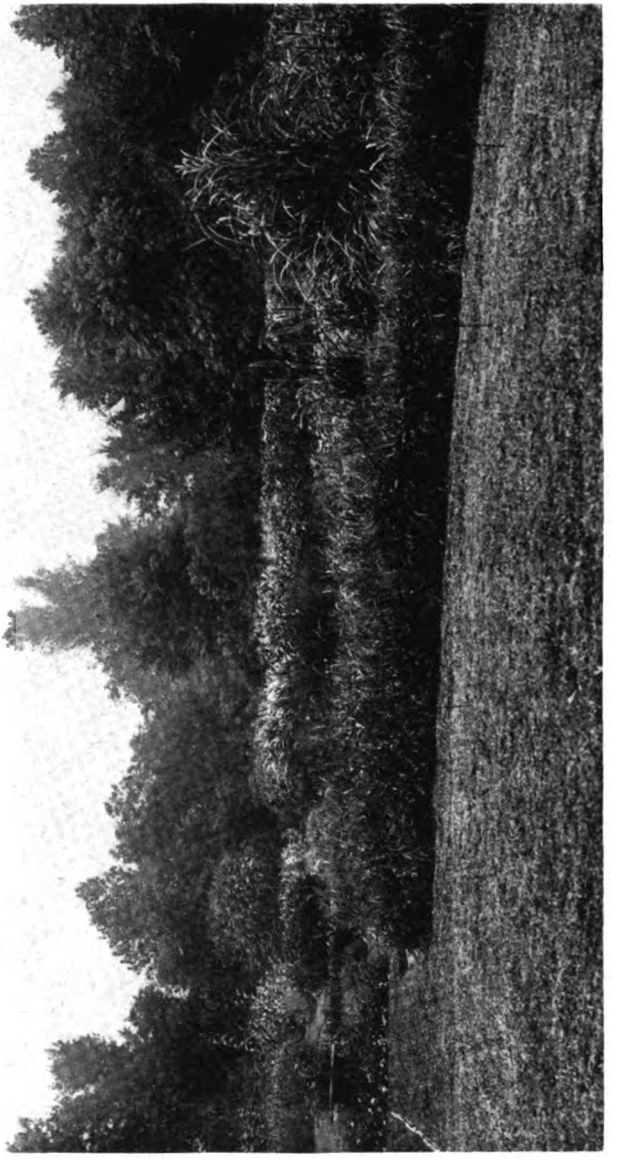

COLLECTION OF ORNAMENTAL GRASSES IN ECONOMIC GARDEN

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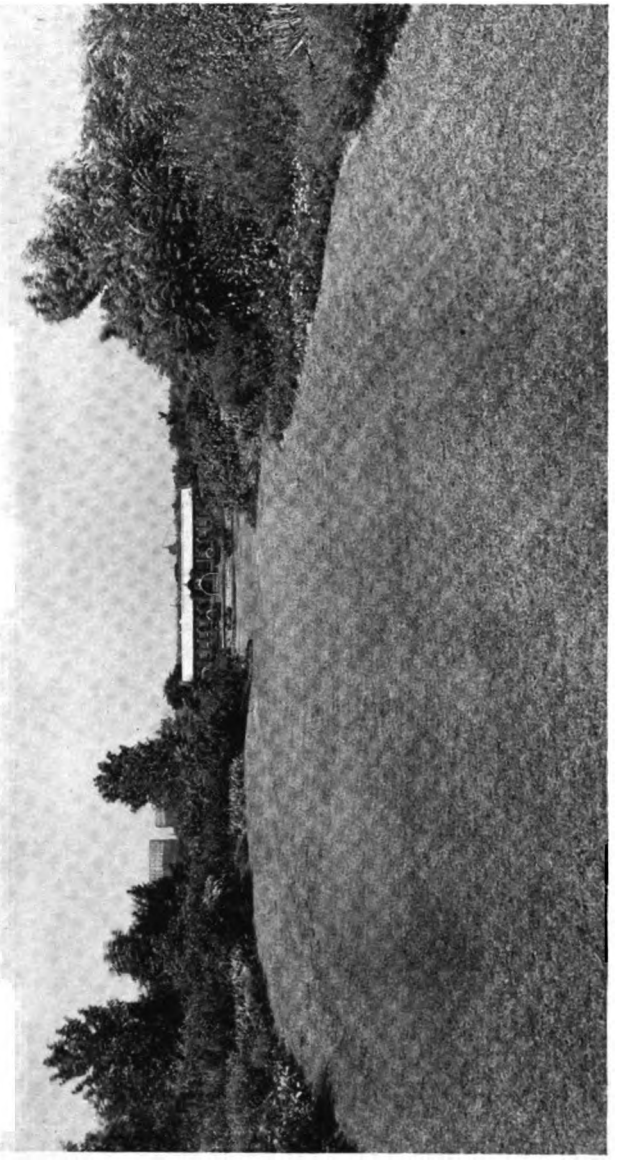

VISTA FROM GROVE ACROSS KNOLLS TO THE LINNEAN HOUSE

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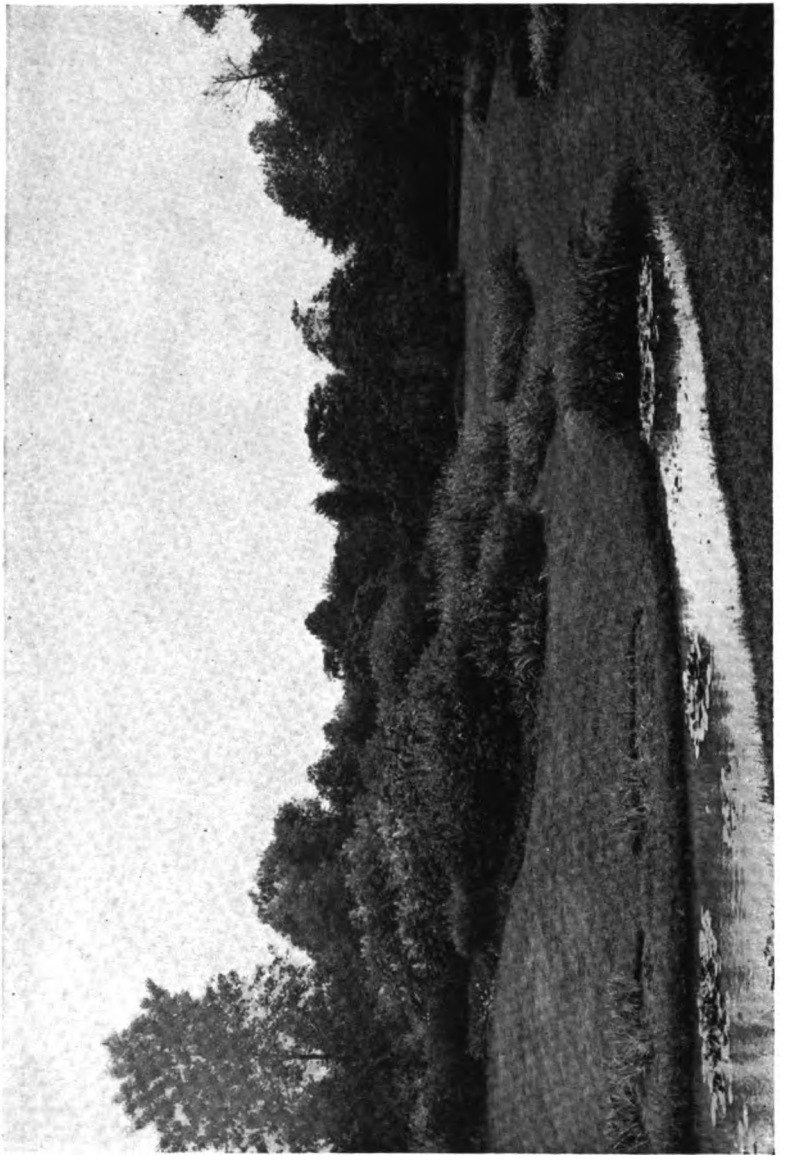

POOLS FOR HARDY WATER-LILIES. KNOLLS IN BACKGROUND

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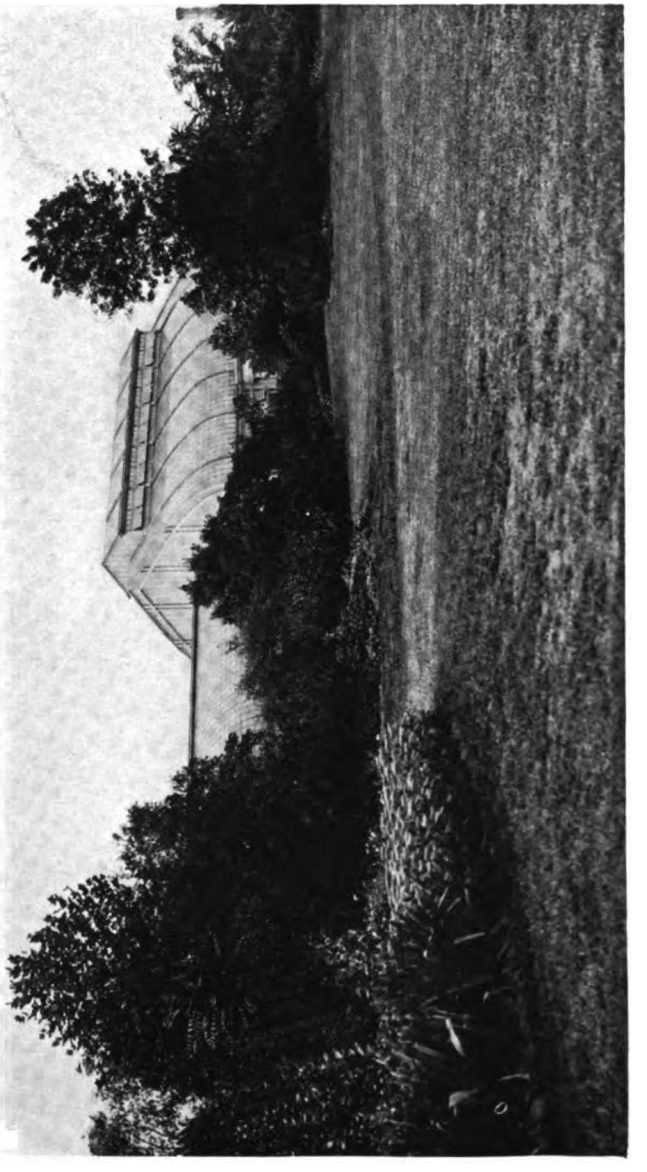

MAIN CONSERVATORIES FROM KNOLLS

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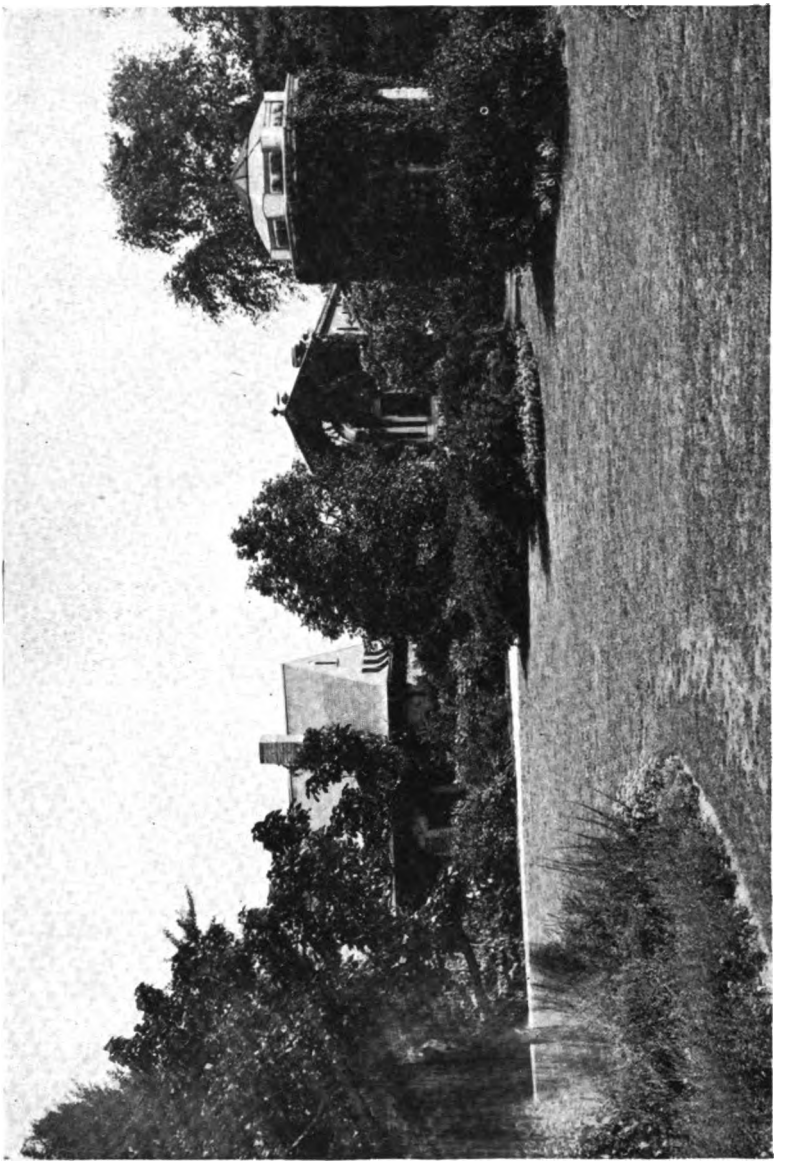

CLEVELAND AVENUE GATE-HOUSE, MUSEUM AND SHELTER CONTAINING STATUE OF VICTORY

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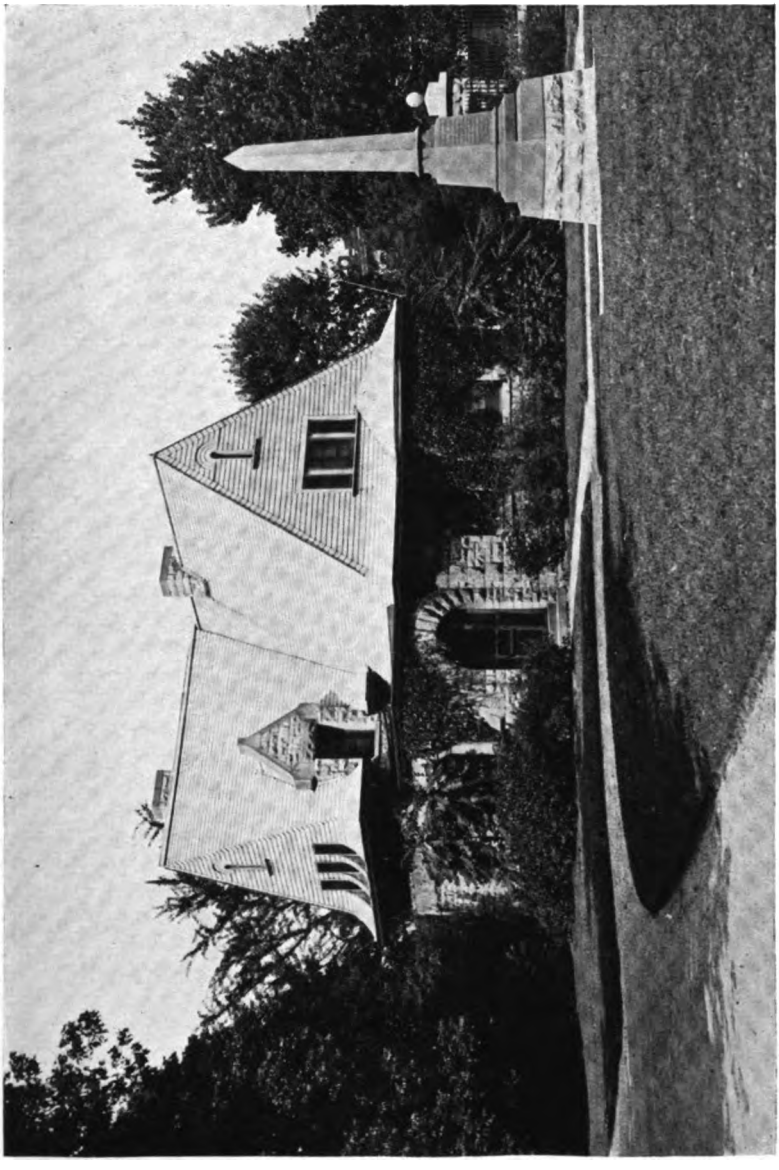

CLEVELAND AVENUE GATE-HOUSE AND MONUMENT TO AMERICAN SCIENCE

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MAUSOLEUM OF HENRY SHAW

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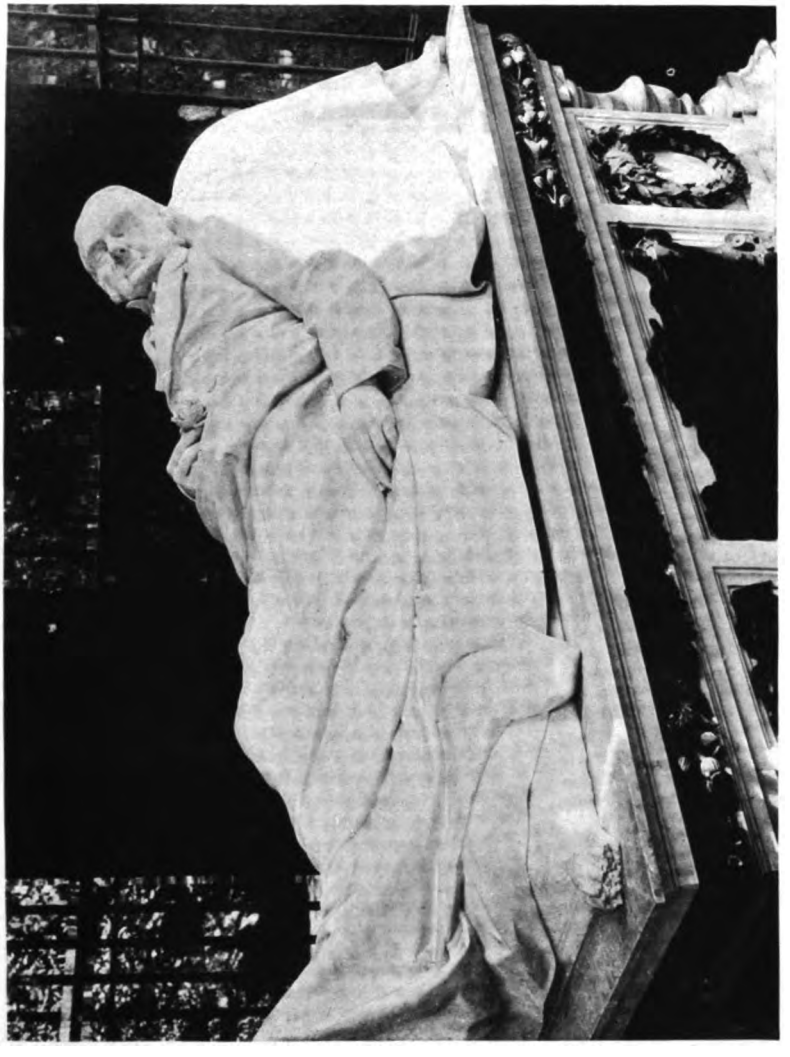

TOMB OF HENRY SHAW

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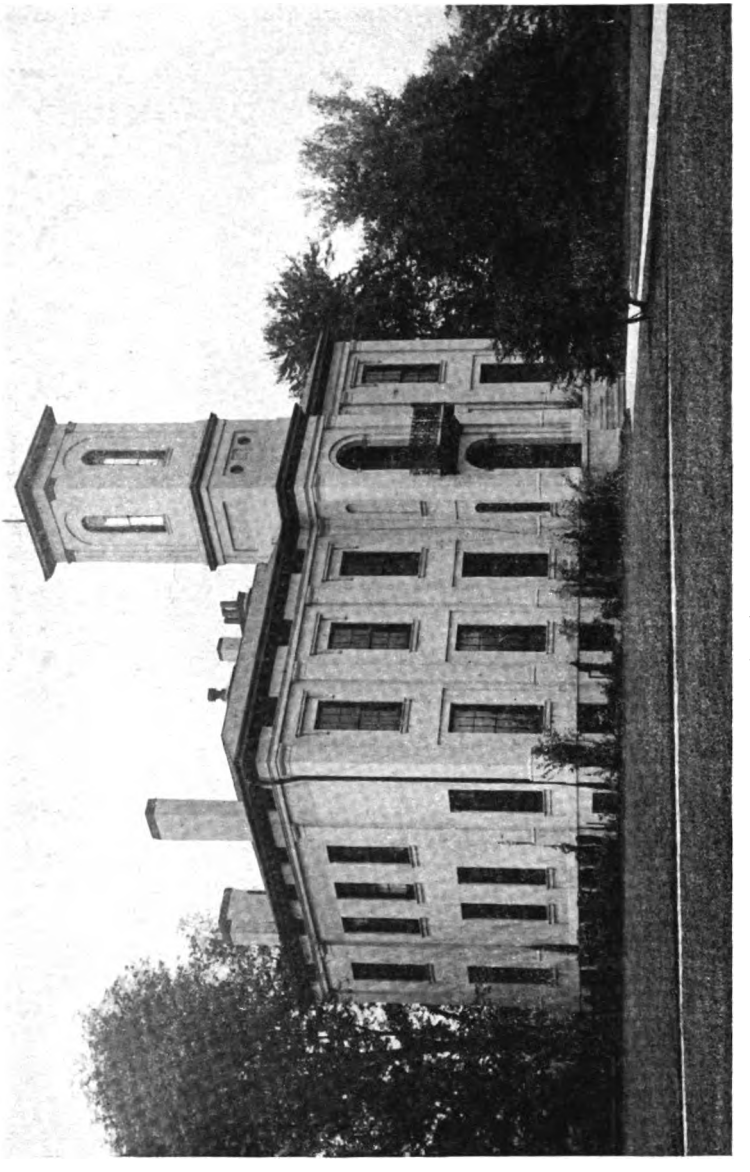

FORMER COUNTRY RESIDENCE OF MR. SHAW, ERECTED 1849. NOW OCCUPIED BY SCHOOL FOR GARDENING

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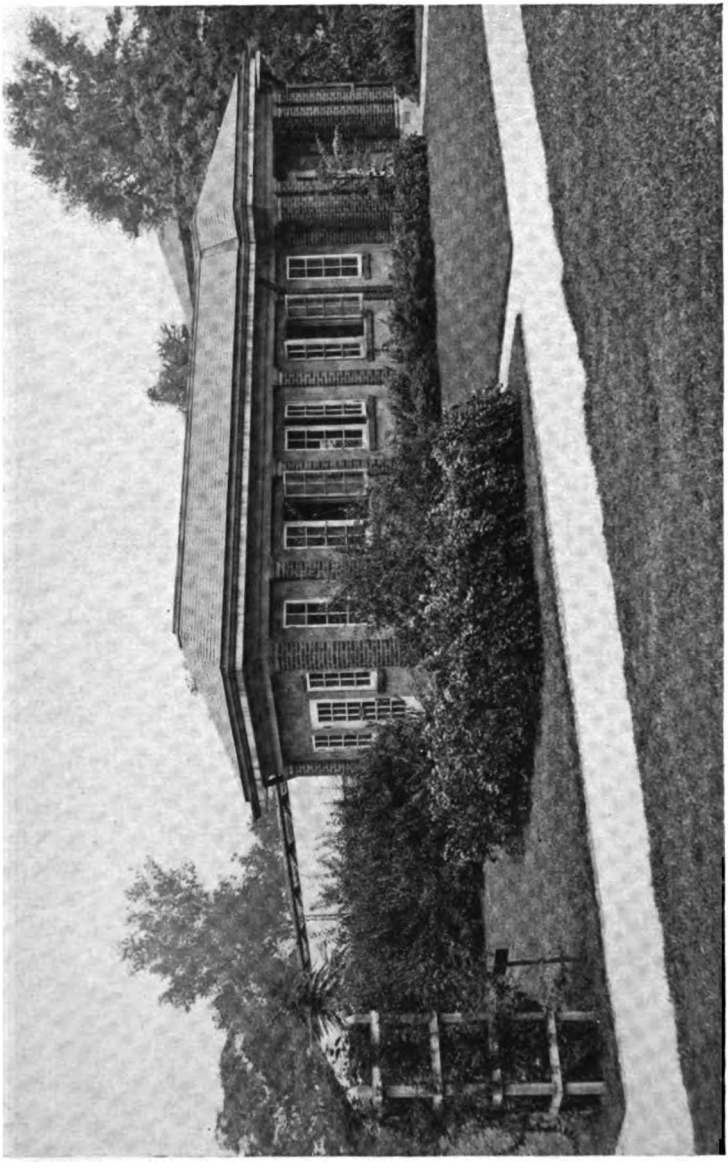

GREENHOUSES USED EXCLUSIVELY FOR EXPERIMENTAL WORK BY GRADUATE STUDENTS IN THE HENRY SHAW SCHOOL OF BOTANY

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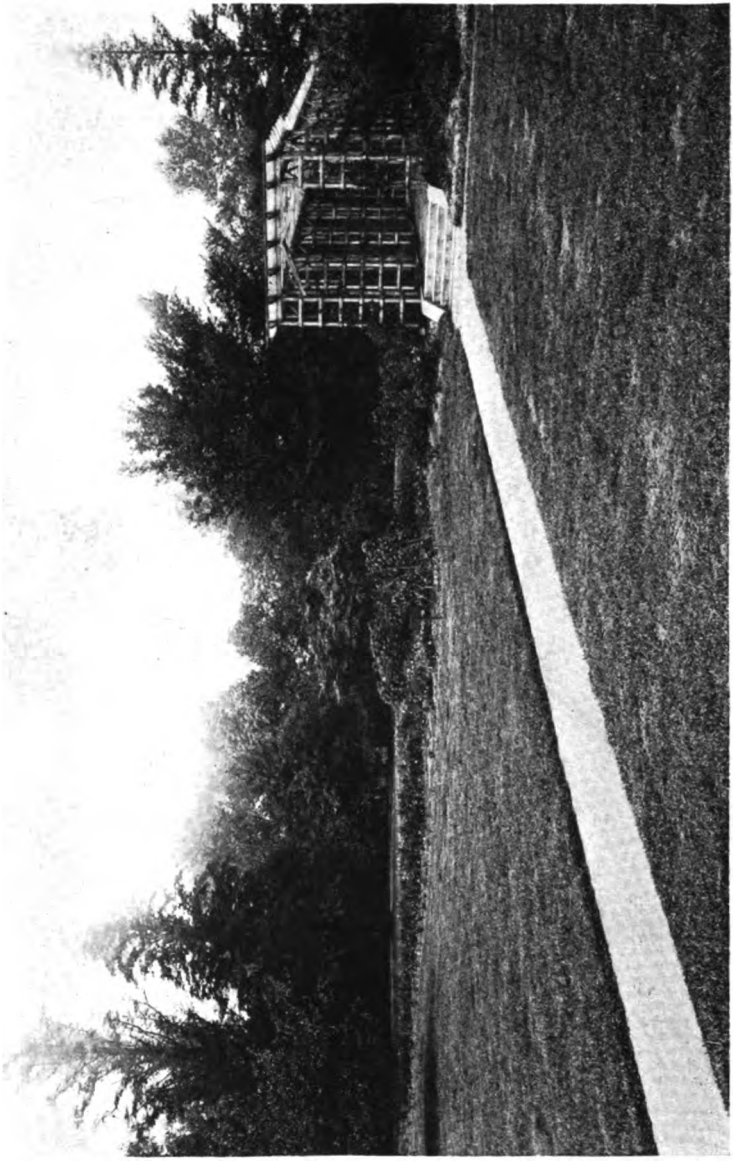

PERGOLA AND TEST GARDEN, THE LATTER DEVOTED TO TESTING NEW OR RARE VARIETIES OF SEEDS AND PLANTS

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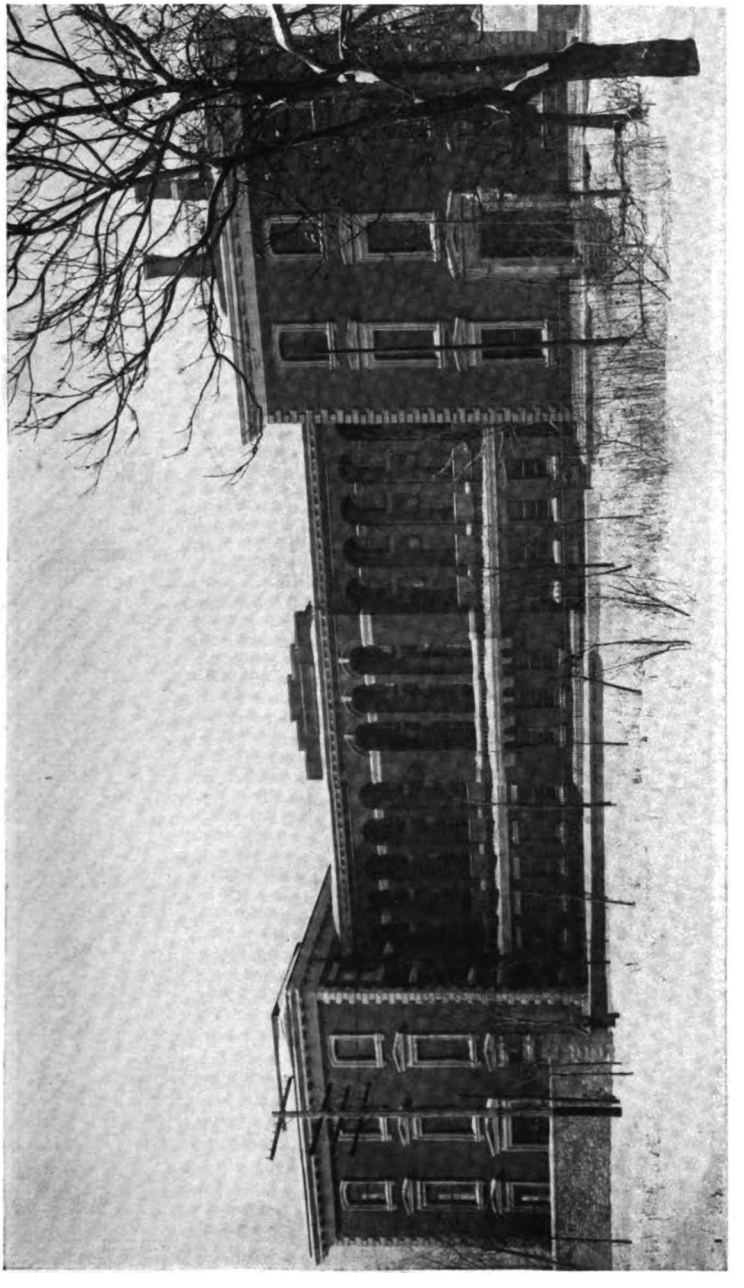

ADMINISTRATION BUILDING
Containing offices, library, herbarium, and laboratories. The right-hand half of this building was Mr. Shaw's city residence, originally situated on Seventh and Locust Streets, moved to its present site in 1890 in accordance with a provision of his will.

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CORNER OF LIBRARY READING-ROOM. FORMERLY DRAWING ROOM OF MR. SHAW'S CITY RESIDENCE

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VIEW OF HERBARIUM SHOWING HOW DRIED SPECIMENS ARE STORED

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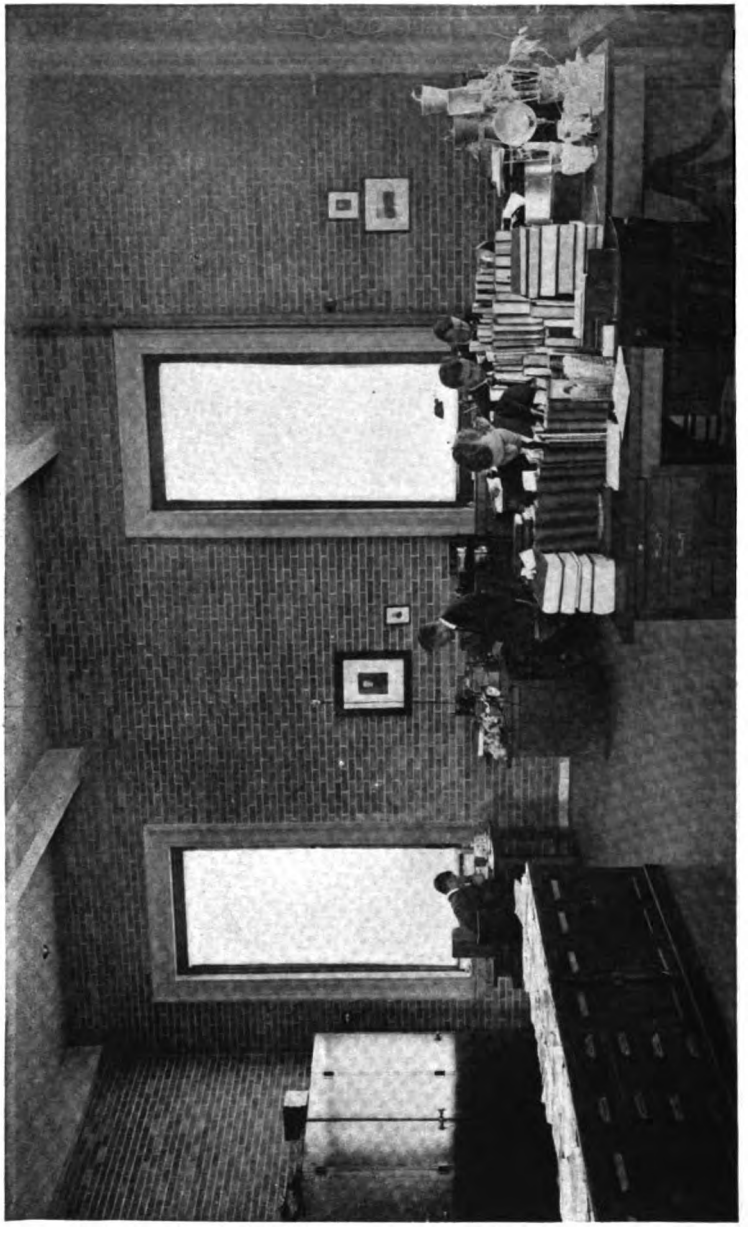

CONFERENCE AND STUDY ROOM FOR RESEARCH STUDENTS IN HENRY SHAW SCHOOL OF BOTANY

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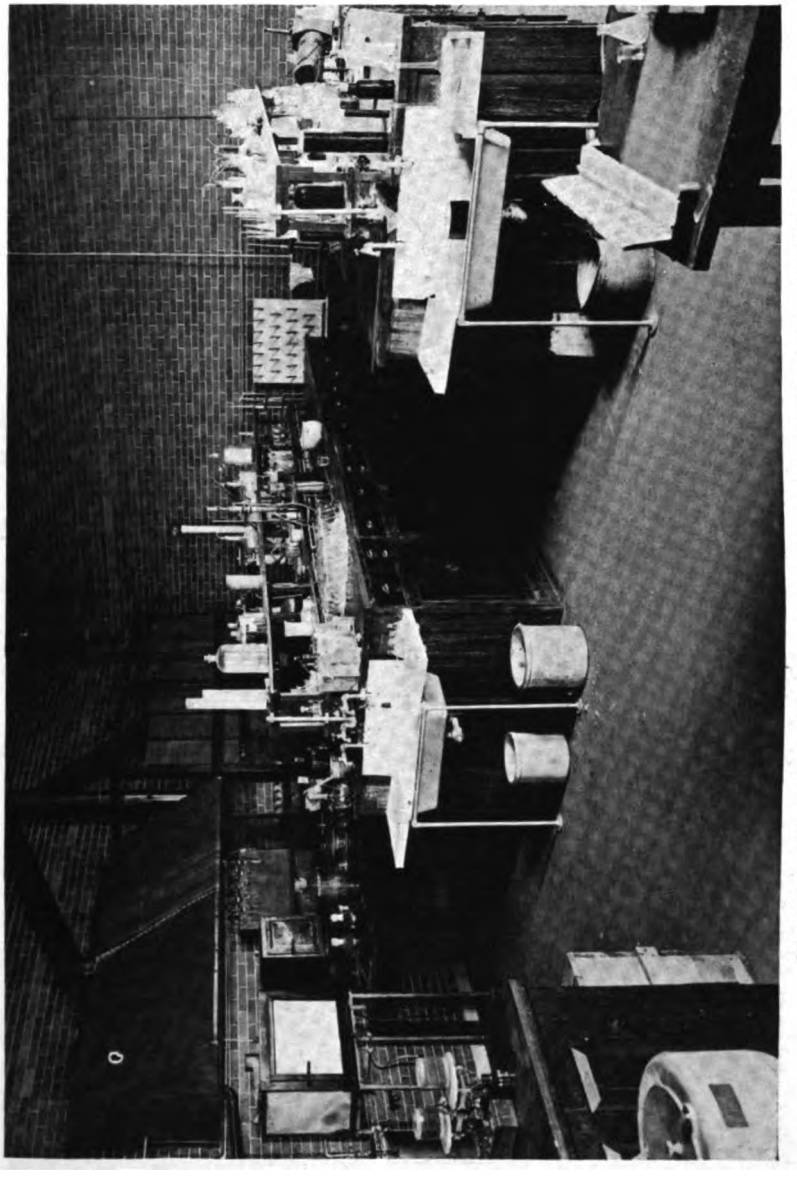

GRADUATE LABORATORIES IN HENRY SHAW SCHOOL OF BOTANY

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VIEWS OF DIRECTOR'S RESIDENCE

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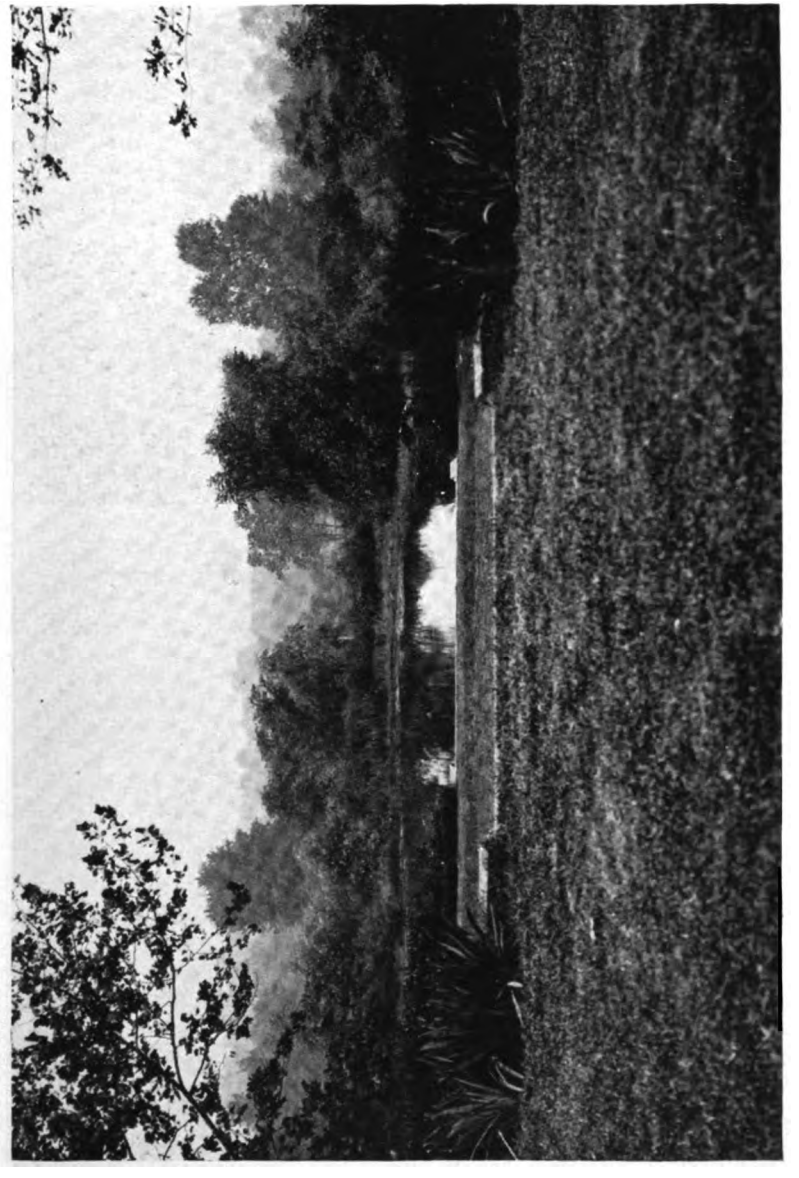

VIEW ACROSS NORTH AMERICAN TRACT FROM DIRECTOR'S RESIDENCE

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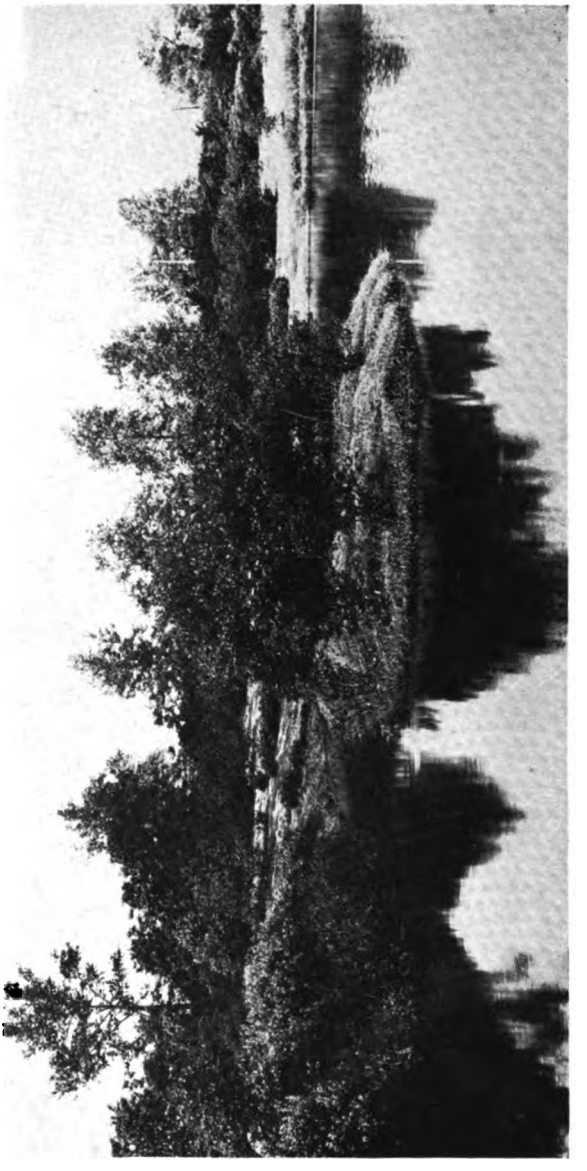

LAKE IN NORTH AMERICAN TRACT

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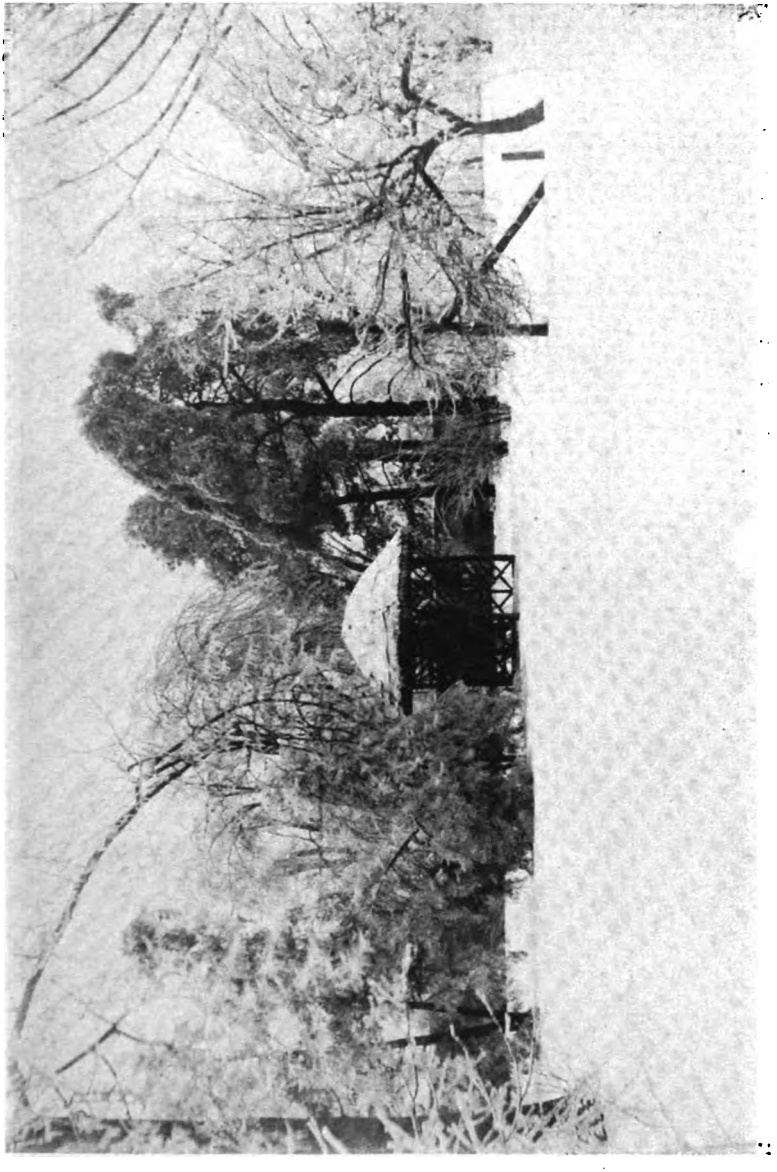

WINTER SCENE IN GARDEN

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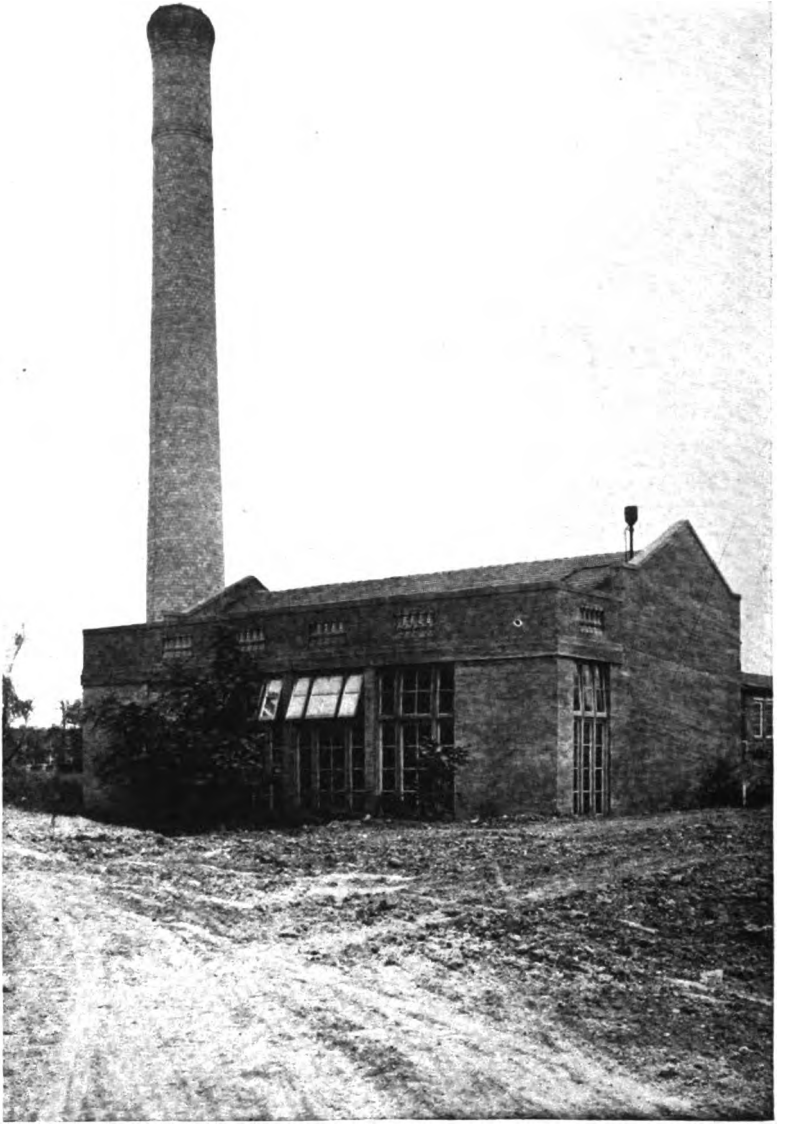

CENTRAL HEATING PLANT FROM WHICH ALL BUILDINGS IN GARDEN ARE HEATED WITH EXCEPTION OF RESIDENCES

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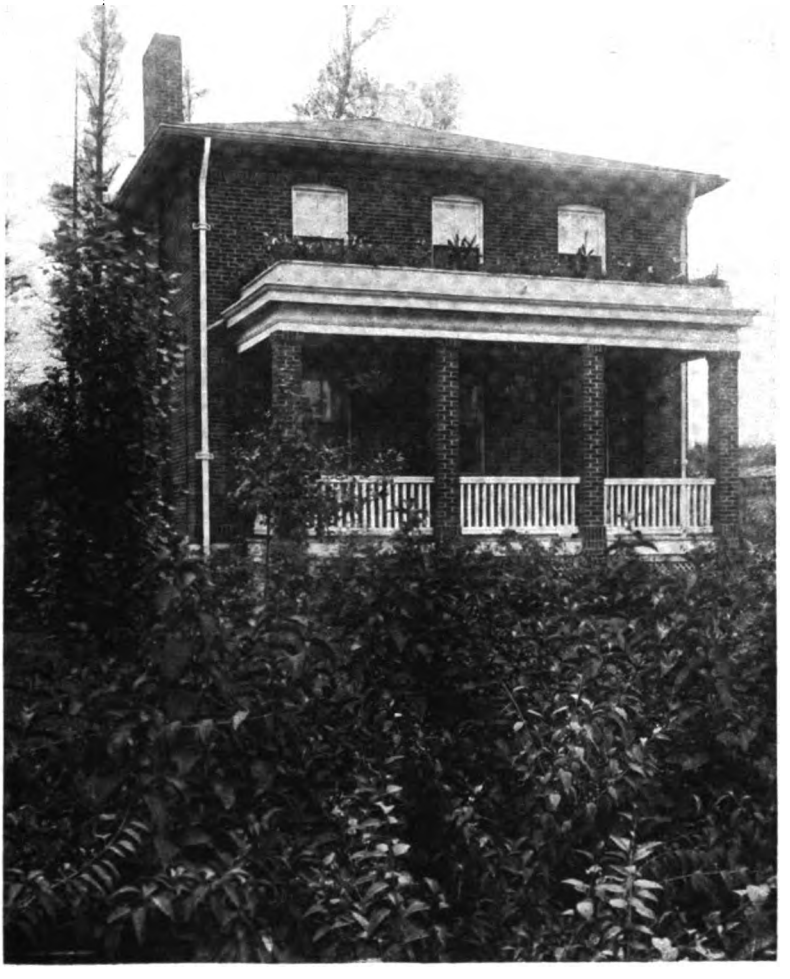

RESIDENCE OF CHIEF ENGINEER

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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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ST. LOUIS, MO.
1919

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BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

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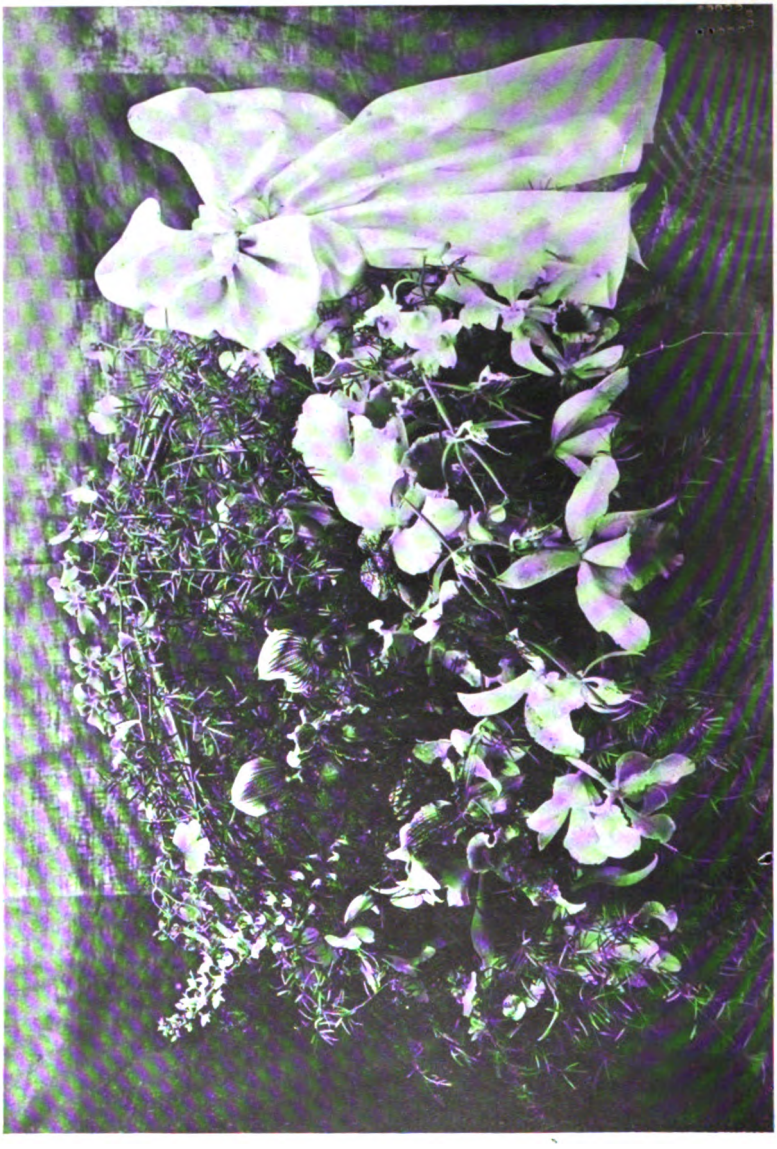

ORCHIDS PRESENTED TO QUEEN OF BELGIUM.

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Missouri Botanical Garden Bulletin

Vol. VII St. Louis, Mo., October, 1919 No. 8

A VARIETY NUT ORCHARD

A development of greatest importance to the nut industry of the United States is the planting this fall of a variety nut orchard at the Missouri Botanical Garden. It is the first attempt in the history of American agriculture to collect in one place and systematically test all varieties of native and imported nuts which are hardy in the latitude of St. Louis.

It is particularly appropriate that the Garden be the institution to undertake this work, because of the fact that there is the greatest collection of wild nuts on the American continent within a radius of 200 miles of St. Louis. The lands adjacent to the Mississippi River and its tributaries contain tens of thousands of pecans, hickories, and black walnuts. Already from this wonderful collection there have been found a number of varieties of nuts that are of great merit, and it only remains for the virtues of these to become sufficiently well known to lay the foundations of a prosperous and enduring industry in Missouri, Kentucky, southern Indiana, Illinois, and such other parts of the country as have similar climatic conditions.

In the following list are given the sorts that the initial planting will contain, and later such new varieties of promise and merit as are discovered will be added to the orchard. The trees will be brought to bearing and complete records will be kept of their performances. In addition to this, there will be placed at the Garden a collection of nuts that are grown there and elsewhere, thus making the institution a clearing-house of information, which will be of the highest value to present and future growers of nut trees.

While this work was initiated by the Missouri Botanical Garden, much of its success will depend upon the coöperation of others interested in establishing a nut industry in this part of the country. Mr. S. M. McMurran, in charge of Nut Disease Investigation for the U. S. Department of Agriculture; Mr. J. Jones, nurseryman, of Lancaster, Pa.; Mr.

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J. F. Wilkinson, nurseryman, of Rockport, Ill.; Mr. Willard G. Bixby, secretary of the Northern Nut Growers' Association, and others prominently identified with the development of this industry have thus far indicated their willingness to be of all possible assistance.

LIST OF NUT TREES IN INITIAL PLANTING

PECANS

Variety Butterick. Grayville, Ill. Parent tree still standing; bearing record prolific. Character of nut: thin-shelled, excellent cracking quality, kernel plump and of good quality.

Variety Kentucky. Rockport, Ind. Parent tree still standing; bearing record prolific. Character of nut: thin-shelled, kernel plump and of good quality.

Variety Major. Henderson County, Ky. Parent tree still standing; bearing record prolific. Character of nut: thin-shelled, cracking quality good, kernel plump and of good quality.

Variety Greenriver. Henderson County, Ky. Parent tree still standing; bearing record prolific. Character of nut: cracking quality good, kernel plump and of good quality.

Variety Niblack. Vincennes, Ind. Parent tree still standing; bearing record prolific. Character of nut: thin-shelled, excellent cracking quality.

Variety Posey. Gibson County, Ind. Parent tree not standing; bearing record regular, but not prolific. Character of nut: thin-shelled, excellent cracking quality.

Variety Indiana. Knox County, Ind. Parent tree still standing; bearing record excellent. Character of nut: shell medium, cracking quality good, kernel plump and of good quality.

Variety Busseron. Knox County, Ind. Parent tree still standing; bearing record prolific. Character of nut: shell medium, of good cracking quality, kernel plump and of good quality.

BLACK WALNUTS

Variety Stabler. Howard County, Md. Parent tree very large, still standing; has borne sixteen bushels in one crop. Character of nut: thin-shelled, of excellent cracking quality, with full kernel.

Variety Thomas. King of Prussia, Pa. Parent tree, originated by Joseph W. Thomas, not now standing; bearing

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record very productive and satisfactory. Character of nut: medium shell, best cracking quality of all large walnuts, kernel large and full.

Variety Ohio. McCutchenville, Ohio. Parent tree still standing; bearing record good. Character of nut: medium to large, thin-shelled, of excellent cracking quality, kernel of good quality.

Variety Miller. Parent tree bearing record prolific. Character of nut: large, medium shell, of good cracking quality.

Variety Lancaster. Fruitville, Pa. Parent tree still standing; has been very heavy bearer. Character of nut: medium to large, heart-shaped, medium shell, of best cracking quality, kernel very full and good.

PERSIAN WALNUTS

Variety Wiltz Mayette. R. Wiltz, San Jose, Cal. (seedling of Mayette). Parent tree still standing; of good bearing record (best variety of Mayette type). Character of nut: very large, thin-shelled, of best cracking quality, kernel full and rich.

Variety Vrooman Franquette. Vrooman Orchard, Santa Rosa, Cal. (seedling of Franquette). Parent tree still standing; one of best bearing and hardiest walnuts east. Character of nut: large, pointed, shell thin and soft, of excellent cracking quality, kernel very plump and white.

Variety Rush. J. G. Rush, Lancaster County, Pa. Parent tree still standing; excellent bearing record. Character of nut: medium to large, shell thin and soft, of excellent cracking quality, kernel full and of good quality.

Variety Alpine Mammoth. France, Alps Mountains (propagated from very select, heavy-bearing seedling tree, Burlington, N. J.). Parent tree not standing; bearing record good. Character of nut: large, shell very thin and soft, of best cracking quality, kernel full.

HICKORIES

Variety Kirtland (shagbark). Yalesville, Conn., by H. S. Kirtland. Parent tree still standing; of excellent bearing record, one of the finest shagbarks. Character of nut: large, shell smooth and of good appearance, of excellent cracking quality, kernel full and very good.

Variety Stanley (shellbark). Carthage, Ind., by Thos. T. Newby. Parent tree not standing; bearing record excellent;

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a beautiful tree with luxuriant foliage. Character of nut: very large, shell thin for this species, excellent cracking quality, full kernel.

Variety Pleas Hybrid (pecan and bitternut). Collinsville, Okla. Parent tree standing; very heavy bearer. Character of nut: large, shape of pecan but somewhat flattened, excellent cracking quality, kernel of good quality when fresh.

Variety Beaver Hybrid (bitternut and shagbark). Millerstown, Pa. Parent tree still standing; good bearing record, very beautiful and rapid-growing. Character of nut: large, shell smooth, white, and of good appearance, good cracking quality, kernel full and of good quality but becomes rancid sooner than pure shagbarks.

PERFUME PLANTS

The use of plants and flowers for perfumery dates from antiquity. History first records the use of perfumery for religious ceremonies in the form of incense. This consisted mainly of aromatic woods and barks, fragrant balms, and resins, referred to in the scriptures as frankincense and myrrh and the sandal and aloes wood of later date.

Perfume was essential in all religious ceremonies in Egypt, being offered in the form of ointment and incense. No king could be crowned without being anointed by the priests, and on special occasions incense was offered up in acknowledgment of the monarch's supreme exaltation. That ancient Egyptians were skilled in the art of perfumery making is attested by a specimen of ointment 3,000 years old in a perfect state of preservation at Alnwick Castle Museum, England.

The Greeks and Romans employed perfumery to a great extent, the Greeks in the time of their splendor making certain essences similar to modern times. Athenaeus quotes a writer of a treatise on perfumes as saying: "The iris is best in Elis and Cyzicus; the perfume made from roses is most excellent at Phaselis, and that made at Naples and Capua is also very fine. That made from crocus (saffron) is in the highest perfection at Soli in Cilicia, and at Rhodes. The essence of spikenard is best at Tarsus, and the extract of vine leaves is made best at Cyprus and Adramyttium. The best perfume from marjoram and from apples comes from Cos. Egypt bears the palm for its essence of cyperus, and the next best is the Cyprian and Phoenician, and after that comes the Sidonian. The perfume called panathenaicum is made at Athens, and those called metopian and mendesian are pre-

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pared with the greatest skill in Egypt." There is no reference in this writer's work to suggest a knowledge of distillation, and it was not until the tenth century that the process was discovered by Avicenna, an Arabian doctor. Previous to this period perfumery consisted of resins, spices, oils, or ointments, scented by contact with fragrant substances.

Five hundred years have passed since the people of southern France have learned the secret of extracting the perfume of flowers and preserving it. The largest industry for the manufacture of natural perfumes is located in Grasse, at the factory of Bruno Court, where 115,000 acres are cultivated for the production of flowers. Every year an average of 1,860 tons of orange blossoms, 930 tons of roses, 147 tons of violets, and 127 tons of jasmine, etc., are picked by hand and carried to the factory where they are sorted and the stamens and pistils separated. Since the average weight of a jasmine flower is about 120 milligrams, approximately five billion blossoms are annually picked by hand. It is interesting to note that two-thirds of the flower pickers of Grasse live to the age of seventy.

The principal methods of procuring the aroma from the flowers are maceration, enfleurage, and distillation. The odors of all vegetable matter are contained in a constituent called otto. This essential oil, or otto, is always present in a liquid form varying in color from light straw to dark red or brown and possessing the odor of the substance from which it is derived. As it exists in such small proportion, when isolated, a remarkable concentration of odor is contained. The yield of otto varies according to the material. For example, nutmeg and lemon rind contain six per cent or more and can profitably be extracted by expression. Roses, however, yield a very low percentage, so little that one hundred pounds of petals will furnish but three teaspoonfuls of otto.

The process of distillation is generally known, consisting of vaporizing a liquid in a closed vessel and conducting the vapor to a receiver in which it is condensed by the application of cold water. When the flowers are placed in the still with the correct proportion of water and heat applied the otto, being volatile, rises with the steam, and both being condensed together, readily separate when cool. The water distillate from the flowers is conserved in huge containers to be used again, or sold as distilled water, rose water, jasmine water, etc.

The more delicate flowers, as tuberose, jonquil, and jasmine, impart their fragrance by the cold enfleurage process. The

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flowers are placed upon the purest of scentless cold lard, which is spread upon glass plates secured to wooden frames. Fresh blooms are daily added until the lard has become impregnated with the otto, the latter being extracted by agitating in cold alcohol and evaporating.

Another method of extracting perfumes is by hot maceration, the flowers being immersed and continually stirred in heated lard. The perfumed lard is afterwards separated from the flowers by filtration and pressure. The most modern method is by employing volatile solvents, by which, in a closed extraction apparatus, light petroleum spirit dissolves the essences, and after evaporation in a vacuum leaves them in a solid form.

Sweet odors are generally classified under three headings: (1) floral, including all those obtained from sweet-smelling flowers, (2) aromal, those derived from all spices, herbs, and roots, (3) balsamic, obtained from such substances as resins, musks, etc. Various essences in compound are used as substitutes in the manufacture of certain perfumes. The heliotrope in concentrated form suggests the aroma of vanilla combined with that of bitter almonds. With this in mind the perfumer makes an excellent "extract of heliotrope" by combining a tincture of vanilla with a small proportion of otto of bitter almonds and sufficient rose and orange flower essences to give sweetness and floral character. A substitute for magnolia odor is obtained by mixing orange flower, tuberose, and violet essences, the addition of a touch of cedrat giving the peculiar sweetness characteristic of the flower.

Chemical substitutes for perfumes, compounded by the chemist, enter greatly in the present-day market, especially in the cheaper perfumery. The laboratory rival of any natural perfume may be a chemical artificial product which is absolutely identical with it, both physically and chemically. Among the sources of perfumery are the laboratory by-products of coal tar.

The Garden collection of tropical perfume plants is located in the south side of the economic house and includes various species of jasmines, myrtles, winter-sweet, patchouli, orange, lemon, cinnamon, camphor, etc. The hardy flowers used for perfumes, such as tuberose, lavender, violet, etc., are grown in season in the economic garden south of the main conservatories.

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PLANTS CHIEFLY USED FOR PERFUMERY.

Common name	Botanical name	Part used
Almond (bitter)	*Amygdalus amara*	Kernel of fruit
Cassie	*Acacia Farnesiana*	Flowers
Cinnamon (true)	*Laurus Cinnamomum*	Bark
Jasmine	*Jasminum odoratissimum*	Flowers
Lavender	*Lavandula vera*	Leaves
Lemon	*Citrus Medica*	Rind of fruit
Orange flower	*Citrus Bigaradia*	Flowers
Orris	*Iris florentina*	Rhizome
Patchouli	*Pogostemon Heyneanus*	Leaves
Rose	*Rosa centifolia*	Flowers
Rosemary	*Rosmarinus officinalis*	Leaves
Tuberose	*Polianthes tuberosa*	Flowers
Vanilla	*Vanilla planifolia*	Beans
Violet	*Viola odorata*	Flowers

PRESENTATION OF ORCHIDS TO THE QUEEN OF BELGIUM

During her visit to St. Louis, October 21, her Majesty, Queen Elizabeth of Belgium, was presented with a basket of orchids by the trustees of the Garden, which, on account of the extremely rare types in the Garden collection, surpassed anything of its kind in the country. Included in the basket were slipper orchids from the famous Brownhurst collection donated by Mr. D. S. Brown in 1918, and two unusual species from Siam, *Paphiopedilum callosum* and its greenish variety *Brownae*. Of especial interest was the Thibet orchid, *P. Fairieanum*, which was lost to cultivation for a number of years and rediscovered by an officer of the British expedition in the Thibet region. Sanders & Sons, orchid specialists of England, valued this orchid so highly as to offer $5,000 for its reintroduction. The basket contained two hundred flowers representing ten genera and thirty-nine varieties, as included in the following list:

Paphiopedilum Actaeus, G. H.*
Paphiopedilum Arthurianum, G. H.
Paphiopedilum Bruno, G. H.
Paphiopedilum callosum, Siam
Paphiopedilum callosum Brownae, Siam
Paphiopedilum Clarkii, G. H.
Paphiopedilum Crossianum, G. H.
Paphiopedilum Elsie, G. H.
Paphiopedilum Creon, G. H.
Paphiopedilum Fairieanum, Thibet
Paphiopedilum Harrisianum, G. H.
Paphiopedilum illustre, G. H.
Paphiopedilum insigne, northern India
Paphiopedilum insigne Dorothy, northern India
Paphiopedilum insigne Sanderae, northern India

*G. H.=Garden hybrid.

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Paphiopedilum Matthewsii, G. H.*
Paphiopedilum tonsum, Sumatra
Paphiopedilum Spicerianum, Assam
Cattleya Daphne, G. H.
Cattleya labiata, Brazil
Cattleya Lueddemanniana, Venezuela
Cattleya maxima, Peru
Cattleya Minnie, G. H.
Cattleya Percivaliana, Venezuela
Cattleya Trianae, Colombia
Brassocattleya Hyeae, G. H.
Laeliocattleya Leoniae, G. H.
Laeliocattleya Lucasiana, G. H.
Laeliocattleya Gottiana, G. H.
Laelia Perrinii, Brazil
Dendrobium bigibbum, Australia
Dendrobium formosum giganteum, Khasia hills
Dendrobium Phalaenopsis, Australia
Oncidium Papilio, West Indies
Oncidium varicosum Rogersii, Brazil
Phalaenopsis Esmeralda, China
Stenoglottis longifolia, South Africa
Epidendrum auritum, Mexico
Epidendrum ciliare, Mexico

*G. H.=Garden hybrid.

NOTES

A party consisting of twenty-two delegates to the annual convention of Iron and Steel Electrical Engineers visited the Garden, September 23, and were shown about by special guides.

Dr. B. M. Duggar, Physiologist to the Garden, was appointed a member of the "Planning Committee" for the division of biology and agriculture affiliating with the National Research Council.

Dr. B. M. Duggar, Physiologist to the Garden, spent the summer, upon invitation of the Director of Botanical Research, in scientific work at the Coastal Laboratory of the Carnegie Institution of Washington, Carmel, California.

On his arrival in St. Louis his eminence, Cardinal Mercier, was presented by the Director and Trustees of the Garden with a handsome bouquet containing some twenty varieties of orchids intermixed with spathe flowers.

The School for Gardening of the Missouri Botanical Garden, which was suspended last year on account of war conditions, reopened in September, and scholarships were awarded to Mr. James Monteith and Miss Virginia McMath of St. Louis, and Mr. Robert Mitchell, of Gotha, Florida.

The following lectures were given by Dr. Duggar during the summer: "Research Work at the Missouri Botanical Gar-

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den and Shaw School of Botany," before the Synapsis Club of the Graduate School of Subtropical Agriculture, Riverside, California, June 18; "Salt Requirements and Hydrogen Ion Concentration in Solution Cultures for Seed Plants," before the Pacific section of the American Association for the Advancement of Science, Pasadena, California, June 21; "The Importance of an Emphasis upon Research under Existing Conditions," before the Science Club of the Utah Agricultural College, Logan, September 18.

Recent visitors to the Garden include the following: Dr. E. S. Moberg, of the University of North Dakota; Dr. A. G. Johnson, Office of Cereal Disease Investigations, U. S. Department of Agriculture; Dr. A. D. Cotton, Mycologist, Royal Botanic Gardens, Kew, England; Prof. R. Koketsu, Plant Physiologist, Imperial University of Kyushu, Japan, and Mr. Kakugoro Nakata, of Kyushu Imperial University, Japan; Mr. A. H. Cockayne, Government Biologist, Department of Agriculture, Wellington, New Zealand; Prof. Frederick Dunlap, Professor of Forestry, University of Missouri; Mr. S. M. McMurran, In Charge of Nut Disease Investigations, U. S. Department of Agriculture; Dr. Hermann Escher, Direktor der Zentralbibliothek, Zurich, Switzerland.

The Rufus J. Lackland fellowships for the year 1919-20 have been awarded as follows:

Mr. W. H. Chambers, B.S. and M.S. University of Illinois.

Mr. G. M. Armstrong, B.S. Clemson College, M.A. University of Wisconsin.

Mr. F. S. Wolpert, A.B. University of Montana.

Mr. E. B. Payson, B.A. University of Wyoming.

C. R. Hursh, B.S. University of Missouri.

Other appointments include the following:

Mr. R. W. Webb, B.S. Clemson College, M.A. Washington University, research assistant; Miss Joanne L. Karrer, B.S. and M.S. University of Washington, and Mrs. Adele L. Grant, B.S. University of California, teaching fellows in the Henry Shaw School of Botany of Washington University, reappointed second year.

Of the former graduate students, research fellows, and assistants in the graduate laboratory, the following have recently accepted new positions: Miss Anne W. Davis, as Chemist, Eastman Kodak Co., Rochester, New York; Dr. A. R. Davis, Instructor in Bacteriology and Soil Chemistry, University of California, Berkeley; Dr. C. W. Dodge, Instructor in Plant Physiology, Brown University, Providence, Rhode Island;

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Dr. G. L. Foster, Instructor in Biochemistry, University of California; Mr. D. C. Neal, Plant Pathologist, Georgia State Board of Entomology, Thomasville, Georgia; Dr. Henry Schmitz, Assistant Professor in Forestry, University of Idaho, Moscow, Idaho; Mr. J. W. Severy, Instructor in Botany, Oregon Agricultural College, Corvallis, Oregon; Mr. H. C. Young, Pathologist, Virginia Truck Experiment Station, Norfolk, Virginia; Dr. S. M. Zeller, Plant Pathologist, Oregon Agricultural Experiment Station, Corvallis, Oregon.

The third number of Volume 6 of the Annals has recently been issued with the following contents:

"An Edible Garden Hebeloma," E. A. Burt.

"Protomerulius Farlowii Burt, n. sp.," E. A. Burt.

"The Micro-Colorimeter in the Indicator Method of Hydrogen Ion Determination," B. M. Duggar.

"Studies in the Physiology of the Fungi. VIII. Mixed Cultures," S. M. Zeller and Henry Schmitz.

"Studies in the Physiology of the Fungi. IX. Enzyme Action in Armillaria mellea Vahl, Daedalea confragosa (Bolt.) Fr., and Polyporus lucidus (Leys.) Fr.," Henry Schmitz and S. M. Zeller.

"Studies in the Physiology of the Fungi. X. Germination of the Spores of Certain Fungi in Relation to Hydrogen Ion Concentration," R. W. Webb.

"Diastase Activity in Relation to Stage of Development and Carbohydrate Content of the Tuber of Solanum tuberosum," R. A. McGinty.

STATISTICAL INFORMATION FOR JUNE—SEPTEMBER, 1919.

GARDEN ATTENDANCE:

Total number of visitors in June	16,706
Total number of visitors in July	16,871
Total number of visitors in August	21,596
Total number of visitors in September	17,558

PLANT ACCESSIONS:

Total number of plants received as gifts in July	2
Total number of plants and seeds received as gifts in August	24
Total number of plants and seeds received as gifts in September	92
Total number of packets of seeds received in exchange in September	9
Total number of packets of seeds received as gifts in September	1

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PLANT DISTRIBUTION:

Total number of plants and seeds distributed as gifts in June	35
Total number of plants and seeds distributed in exchange in June	12
Total number of plants distributed in exchange in September	18

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June	5
Total number of books and pamphlets donated in June	85
Total number of books and pamphlets bought in July	33
Total number of books and pamphlets donated in July	250
Total number of books and pamphlets bought in August	14
Total number of books and pamphlets donated in August	128
Total number of books and pamphlets bought in September	7
Total number of books and pamphlets donated inSeptember	67

HERBARIUM ACCESSIONS:

JUNE

By Purchase—

Rev. John Davis—Specimens from Missouri, etc.	500

By Gift—

J. M. Greenman—Plants of Arkansas	3
N. E. Hansen—Cultivated specimen of *Rhipsalis Cassytha* Gaertn.	1
J. M. Jackson—*Magnolia acuminata* L. from northwest Missouri	1
O. S. Ledman—*Delphinium* sp. from Missouri	1
Mrs. C. McNairy—*Sedum pulchellum* Michx. from Arkansas	1
Dr. G. L. Peltier—*Corticium vagum* on *Melilotus alba*	1
Charles Studt—*Sedum pulchellum* Michx. from Missouri	1

JULY

By Purchase—

Canton Christian College—Plants of China	463
Herbert C. Hanson—Plants of Texas	316

By Gift—

Walter H. Aiken—*Nicotiana glauca* Grah. from Texas	1
Prof. E. A. Bessey—*Corticium* on leaves of *Plantago*	1
T. S. Brandegee—*Senecio Deppeanus, S. parasiticus* Hemsl., and *Liaburn andromachioides* Benth. & Hook. f. from Mexico	3
J. A. Drushel—Plants from Vermont, New Jersey, and Missouri	7
Dr. A. H. Graves—*Merulius ambiguus*	1
Dr. J. M. Greenman—Plants of St. Louis Co., Missouri	29
Dr. G. T. Moore—*Dictyophora duplicata*	1
Geo. H. Pring—Cultivated specimen of *Arenga saccharifera* Labill.	1
University of California, by Prof. F. J. Smiley—*Erechtites prenanthoides* DC. from California	1
Prof. A. H. Van Vleet—*Phacelia strictiflora* Gray from Oklahoma	1
S. P. Verner—Plants of Panama	3
Prof. A. Yasuda—Fungi of Japan	20

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By Exchange—

New York Botanical Garden—Plants of Colombia, collected by Dr. F. W. Pennell..... 741
New York Botanical Garden, by Dr. P. A. Rydberg—*Senecio* sp. from Panama..... 1
Dr. Earl E. Sherff—Photographs of types and authentic specimens of *Bidens* and *Taraxacum*..... 18

AUGUST

By Gift—

Prof. C. E. Allen—Cultivated specimen of *Incarvillea Delavayi* Bur. & Franch., a native of China..... 1
Miss Arnott—*Scirpus americanus* Pers. from Jefferson Co., Mo..... 1
A. W. Haupt—*Habenaria* sp. and *Potamogeton epihydrus* Raf. from Wisconsin..... 2
C. O. Heer—Cultivated specimen of *Pyrus Halliana* Hort..... 1
A. S. Kalenborn—*Gentiana* sp. from the Andes of Peru..... 1
Artena M. Ollson—Cultivated specimen of *Justicia* sp..... 1
Dr. L. O. Overholts—*Mucronella Ulmi* Peck..... 1
T. Petch—*Necator decretus*, stage of *Corticium salmonicolor*. 1
Geo. H. Pring—Plants of Missouri..... 20
Carleton Rea—*Thelephoras* of England..... 3
Dr. J. R. Weir—Fungi of islands of Guam and Cuba, and of Rocky Mountains..... 29
F. Weiss—*Tremella reticulata* from Minneapolis, Minn..... 1
Dr. S. M. Zeller—Fungi of Oregon..... 9

By Exchange—

New York Botanical Garden, by Dr. Francis W. Pennell—*Pentstemon* of Colorado..... 5

SEPTEMBER

By Gift—

Mrs. J. M. Bettis—Plants of Missouri..... 2
C. W. Campbell—*Eupatorium serotinum* Mx. from Illinois... 1
E. H. Cole—Cultivated specimen of *Polygonum orientale* L.. 1
Geo. M. Darrow—*Calostoma cinnabarinum* from Massachusetts..... 1
Mrs. Adele Lewis Grant—*Mimulus leptaleus* Gray from California..... 1
Dr. J. M. Greenman—Plants of Jefferson Co., Missouri..... 28
H. S. McHenry—Cultivated specimen of *Ipomoea purpurea* var. *alba* with double flowers..... 1
J. C. Nelson—*Senecio* from Oregon..... 11
Prof. A. Yasuda—Fungi of Japan..... 15
Dr. S. M. Zeller—Fungi of Oregon..... 8

By Exchange—

Edwin B. Payson—Plants of Colorado..... 62
Philadelphia Academy of Natural Sciences, by Dr. Stewardson Brown..... 966

Total..... 3,284

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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Missouri Botanical Garden Bulletin

Vol. VII St. Louis, Mo., November, 1919 No. 9

EGYPTIAN PAPER PLANT

One of the most popular aquatic plants in the Garden collection is the *Cyperus Papyrus,* commonly called the Egyptian paper plant, since it was one of the first plants used by the ancient Egyptians in the manufacture of paper. The species which affords the material used for writing purposes is of genuine African origin, establishing itself in marsh lands and in sluggishly flowing water. It is also found in the southern part of western Asia and Syria, on the shores of the Jordan, the lake of Tiberias, and in certain localities in Sicily. At the time of construction of the pyramids the papyrus must have been utilized, for it is represented by hieroglyphic inscriptions of book rolls prepared from the pith. Other monuments dating from the time of the Pharaohs frequently show attempts to reproduce the luxuriant growth of papyrus thickets combined with the diversified fauna of the region.

Up to the sixth century the papyrus was still used for writing material and was a source of wealth to the Egyptians. Upon the advent of the parchment, however, the cultivation of papyrus was abandoned, the ground gradually being more profitably employed until finally the last plant disappeared from the cultivated area in the upper Nile region. At the present time in order to see natural papyrus banks one must ascend the Nile to Khartoum and follow up the White Nile where island clusters rise to a height of over fifteen feet, forming impenetrable thickets of mop-like foliage and producing such luxuriant growth as to obstruct the flow of the river in many places. According to Stanley and others, the region of Victoria Nyanza is occupied by enormous forests of papyrus, particularly in the shallow places of the Sobart.

The word paper is directly derived from papyrus, and the word Bible from biblyos, the Greek name of the papyrus plant. During the period of the Byzantine empire papyrus was used in the copying of legal works. The statement of the time of the court sitting was glued on the report of the prose-

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cution, the witness's testimony, or the notary's documents, hence the word protocol, signifying glued.

According to Pliny, single sheets of papyrus were prepared from strips of the pith, one strip being laid vertically and the second glued horizontally above. The lay of the fibers, even up to the present day, is easy to distinguish. The adhesive material was made from a paste of flour and hot water, and in some cases vinegar. Reference is also made to the use of white bread soaked in hot water. After being glued the edges were cut smooth and pressed while still wet, the strips then beaten with a hammer, and again fastened together with an adhesive substance. The piece was then placed under a press to free it from unevenness and finally beaten or hammered and placed in the sun to dry. After the rough or uneven places had been smoothed out with a tooth or shell it was considered a finished product.

The manufacture of the book, or more correctly the roll, was accomplished by gluing the prepared leaves together. The best leaves were used first, then those of inferior type, and finally the poorest ones. This is explained more fully by Birt: "The best leaves were also the most durable and were placed at the end, because, when rolled up, these first leaves came on the outside of the roll and were, in consequence, more exposed to tearing, dampness, or any other injury." The first requirements of good paper (charta) are, according to Pliny, tenuitas, densitas, candor, levor—that is, thinness, density, brilliancy and smoothness.

Some noteworthy fragments of papyrus manuscripts were discovered in later years when the papier-mache mummy cases were taken apart, this Egyptian pasteboard being found to consist of numerous layers of papyrus glued together.

Culture.—Naturally the aquatic plant is a very rank grower, establishing itself readily under artificial conditions and, like the common umbrella plant, growing either as an aquatic or semiaquatic. The seeds should be sowed in early spring in sandy soil and sparsely covered with finely sieved soil. The pots should then be placed in pans of water to prevent the soil from drying and the tops of the pots covered with glass until the seeds have germinated. Being purely tropical in habit, a minimum temperature of 50° F. should be maintained. The seedlings should be pricked off when convenient size to handle and shifted into small pots, later being transplanted to larger pots according to increase of growth. During the latter part of May or early June they

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may be planted outside in shallow ponds. The plants should be dug in the fall before frost and divided into small sections for potting and storage in the greenhouse. Copious quantities of water should be given at this time so as to gradually readjust them to semi-aquatic conditions.

TROPICAL FRUIT HOUSE

The popularity of the tropical fruits grown in the economic house has necessitated a decided increase in the collection. The varied industries house has therefore been entirely replanted with both the common and rarer varieties of fruits grown in Florida and California. Their concentration in a special house should afford excellent opportunity for visitors to study the habit of growth and flowering and fruiting periods of these fruits not ordinarily seen outside of the tropics.

In view of the fact that especial interest is usually shown in the citrus plants a collection of standard varieties is planted in the fruit house, including orange, lemon, lime, pomelo and kumquat. These plants were especially grown in Florida for the Garden, being twelve-months-old stock budded upon the sour orange stock *Citrus trifoliata*. This species is the hardiest type known in this country—in fact, it is hardy as far north as Washington, D. C., and is reported to withstand zero weather. It is chiefly used as a stock plant for the budding of various varieties, the fruits being of excellent quality and ripening several weeks in advance of those on their own roots. It is considered the only stock for the popular Satsuma orange, due to its influence upon the hardiness, quality and quantity of the fruit.

A recent introduction of two new species of oranges by E. H. Wilson from China has been secured for the Garden from the Arnold Arboretum. These interesting species were collected in the highlands of southwest China at an elevation of 2000 to 5000 feet. They are not closely related to the other known species of the genus Citrus, and are the northernmost evergreen representatives of the Citrus group. Their introduction was purely for breeding purposes to further improve the hardiness of the orange and lemon. The plants are small trees, with long, slender spines and narrow leaves. The fruit is acid and of good flavor, and the seeds are rather large compared with other varieties.

A noteworthy specimen of the ponderosa lemon is at the present time bearing many well-developed fruits. This is the

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largest of any type, the fruits weighing from one and a half to two pounds. It is occasionally grown as a house plant for ornamental use.

PLANTS GROWN IN TROPICAL FRUIT HOUSE

Achras Sapota. Sapodilla plum
Heritieria littoralis
Ananas sativus. Pineapple
Bertholletia braziliana. Brazil nut
Brosium Alicastrum. Bread nut
Cacara erosa
Carica Papaya. Papaya
Carissa grandiflora. Natal plum
Catha edulis. Jag plant
Chayota edulis. Chayote
Citrus Aurantifolia. Lime
Citrus Aurantifolia "Tahiti." Tahiti lime tree
Citrus grandis. McCarthy grape fruit
Citrus grandis. Foster's grape fruit
Citrus ichangensis. Itching orange
Citrus Medica. Citron
Citrus mitis. Calamondin orange
Citrus nobilis. King orange
Citrus nobilis deliciosa. Tangerine orange
Citrus sinensis. Pineapple orange
Citrus ponderosa
Cyphomandra betacea. Tree tomato
Dalbergia sp.
Eriobotrya japonica. Loquat
Eugenia Jambos. Rose apple
Eugenia myrtifolia. Australian brush cherry
Ficus Carica. Fig.
Feijoa Sellowiana. Pineapple guava
Fortunella crassifolia. Meiwa kumquat
Fortunella margarita. Nagami kumquat
Garcinia Mangostana. Mangosteen
Garcinia xanthochymus
Inga edulis
Kigelia pinnata
Litchi chinensis. Litchii
Lucuma mammosa. Marmalade plum
Mangifera indica Tatarifera. Mango
Mangifera sp. Haden's mango
Melicocca bijuga. Spanish lime
Murraya exotica. Orange jessamine
Myrciaria cauliflora
Nephelium Longana
Persea gratissima (sharpless). Avocado
Persea gratissima "El Ora". Avocado
Persea gratissima. "El Fuerte". Avocado
Punica granatum. Pomegranate
Rhizophora Mangle
Schinus terebinthifolius
Spondias tuberosa
Ziziphus Jujuba
Wrightia tomentosa

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FEIJOA SELLOWIANA

This ornamental shrub, commonly called the pineapple guava, is of recent introduction in the United States although it has been known to Europeans for over thirty years. It was first collected in South America by Dr. Edouard Andre, who planted it in his garden at Villa Colombia, on the Riviera, and succeeded in developing its first fruits in 1897. In 1891 Dr. F. Franceshi, of Santa Barbara, obtained a stock from Andre and brought about the original introduction in California. As a commercial fruit it is becoming popular in Florida and California. At Gotha, Florida, plants have been grown since 1911 by Mr. H. Nehrling, and at Miami by the United States Department of Agriculture.

The fruit is about the size of a walnut, glossy green, and slightly fragrant when ripe. It is used in jams, jellies, etc., and in combination with the guava is excellent in preserves. In England its cultivation is not successful, according to the Gardeners' Chronicle, but it is useful as an ornamental pot plant. The specimen in the economic house has bloomed profusely but has not produced fruit.

PAPAYA (CARICA PAPAYA)

The papaya is a popular breakfast fruit for both rich and poor in Hawaii, and with the exception of the banana is about the only fruit which enters into the daily diet of the people. Due to the large quantity of papain contained, an enzyme which aids in digestion, it is extremely wholesome and large quantities may be eaten.

The plant grows to a height of twenty feet, bearing large palmate, seven-lobed leaves often measuring two feet across. The fruit varies in size up to fifteen pounds, forty or fifty being borne on a tree. The flesh is salmon-pink to yellow, somewhat resembling a muskmelon. Nearly all parts of the plant are credited with some medicinal value. The seeds possess anthelmintic and carminative properties, the bark is used in the manufacture of rope, and the roots afford a nerve tonic. The most important medicinal property is contained in the milky juice which furnishes the papain of commerce. This is obtained by cutting or slashing the fruit and allowing the juice collected to evaporate to a granular condition. In this crude form it brings a market price of four to eight dollars a pound. The leaves and juice are used to render tough meat tender. This is accomplished by wrapping the meat in the leaves over night, by rubbing a slice of the green fruit

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over the flesh, or by dipping the meat in a solution of the juice for a few minutes.

The specimen of the papaya in the economic house has borne over two dozen fruits in the last two years.

MANGO (MANGIFERA INDICA)

While the cultivation of the mango dates from earliest antiquity in India, the last two centuries have seen it extensively grown in other tropical regions. It enters into the diet of millions of people and is termed the king of tropical fruits or the apple of the tropics. The great Mogul Akbar, in the sixteenth century, planted the famous Lakh Bagh, an orchard containing 100,000 plants, some of which are still growing. Careful breeding and selection have resulted in many different forms perpetuated through the medium of inarching or grafting by approach. Some trees attain a height of seventy feet, producing an abundance of fruit valued at 150 dollars a ton.

The resemblance of the mild and even climate of Saharanpur, where mangos thrive, to that of California and Florida suggested to government explorers the possibility of mango cultivation in this country. The introduction into the United States is of recent origin, probably about 1880, when Jacob Miller, of Hollywood, California, received seeds from Guatemala City. The plant raised has had the advantage of a particularly mild location and has developed into a large tree without having been cut back by the frost. An abundance of fruit has been borne, which, however, is of little value due to being produced from a seedling tree. More recently the mango has been cultivated in southern Florida where climatic conditions are more favorable than California. The most extensive groves are at Miami, where, during 1901, experiments were carried out successfully in budding selected varieties for perpetuation. Mangos are now shipped to New York, Chicago and St. Louis, from Florida. The individual fruits are wrapped in tissue paper and packed with excelsior six in a basket. These are subsequently crated, six baskets to a crate. They are usually shipped during late July and August.

The large plants growing in the economic house are of the seedling type, rarely producing fruit. The budded stock lately introduced in the tropical fruit house, however, will undoubtedly bear fruit after becoming established.

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AVOCADO (PERSEA GRATISSIMA)

The avocado has been grown in Mexico for several centuries, as many as 2000 to 3000 fruits often being produced annually from a single tree. However, these are of the seedling type and of very little value commercially. The fruit varies with the variety, but generally it is about the shape and size of a pear and sometimes bears the misleading name of alligator pear.

Within the last twenty years plant breeders of Florida and California have given systematic attention to the improvement of the avocado. Previous to 1900 propagation was entirely through seed, which resulted in inferior fruit similar to that of the Mexican type. Since that date propagation has been effected by budding, using selected and varied varieties. One of the earliest orchards from budded stock was planted by Mr. S. B. Bliss, of Miami, Florida, and consists of twenty acres of the Trapp variety. The first marketable crop was shipped about 1910. A good yield of the type is between two to three hundred fruits annually for a medium-sized tree.

The fruit of selected varieties varies from one to six inches in diameter and from several ounces to three or four pounds in weight. In shape it ranges from spherical to slender pyriform. The skin is similar to that of the apple in thickness, is occasionally soft and pliable, and sometimes coarse granular and woody, suggesting a shell ⅛ inch thick. The fleshy inner portion is a mass of yellowish pulp of the consistency of butter and of a nutty flavor. The avocado is different from other fruits, due to its high percentage of vegetable oil, reaching 18 per cent. It is therefore considered more as a food than a dessert.

In commercial use the fruit is selected that has uniformity in shape, the round or oval type being easier to pack than the pear or bottle-shaped varieties. The ideal skin should be thick enough to withstand handling in packing and shipping. Flavor and quality are of course important factors.

The largest plant in the economic house reaches the roof, being thirty feet in height. It is a representative of the seedling type.

CHAYOTE (CHAYOTA EDULIS)

The chayote is a strong climbing plant or vine somewhat resembling the common cucumber in growth, although the vines are far more rampant. It is readily killed by frost but is reported hardy as far north as South Carolina, provided the

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roots are protected by a heavy mulch of stable manure. The new growth starts up just as soon as warm weather sets in, producing favorable crops of fruit for several years.

The fruit is somewhat corrugated and varies according to the type between linear and broadly pear-shaped. The color also varies from white to a light green. The chayote is esteemed as a vegetable similar to the squash or the vegetable marrow. It may be stuffed and baked, creamed, or fried with butter as fritters. It also forms a palatable salad with mayonnaise dressing, and when made into sauce it is strikingly similar to apple sauce. In the tropics the large tuberous root is used as food in a similar manner to the well-known yams.

The Garden specimen of the chayote, previous to its removal to the tropical fruit house, bore numerous fruits showing the usual factor of germination while attached to the parent vine.

CHERIMOYA (ANNONA CHERIMOLA)

The fruit obtained from the present-day selected and budded varieties of cherimoya is sometimes called one of the three finest fruits of the world, the other two being the pineapple and the mangosteen. When thoroughly chilled there are few fruits to equal it as a dessert.

The genus is native to the Andes of Peru and adjacent region. At a very early date it was introduced into Central America and Mexico, where it became naturalized. It was probably brought into California in 1871 by the late Judge R. B. Ord, of Santa Barbara. Since this introduction numerous seedlings have been raised and planted in the vicinity, the atmospheric conditions and the soil of Hollywood, especially along the slopes of the valley west, being unusually suited to their cultivation. One of the largest groves is owned by C. P. Taft and consists of about 100 plants.

In Madeira the cherimoya has supplanted the grape vine, particularly on the estates of the southern slopes of the island. Here the cultivation is decidedly systematic, two-year-old budded or grafted stock being used, and plants usually trained upon trellises or walls to enable the fruit to hang in the shade during ripening.

The cherimoya grows to a height of fifteen to twenty feet. The flowers are remarkably uniform, but vary somewhat in size. The fruit varies considerably in shape and appearance,

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sometimes conical and sometimes heart-shaped or ovoid, the surface being covered with concave U-shaped areoles, each of which bears a small wart or tubercle. The favorite commercial type of California is called the Golden Russet. This is pear-shaped in outline, with small wart-like tubercles near the rounded apex of the areole. Through careful selection varieties of fine flavor with very few seeds may now be obtained, the fruit weighing from twelve to sixteen pounds. According to Fawcett, ordinary fruits weighing from three to eight pounds have sold in the London markets at one dollar and a half, the larger ones at two and a half to three dollars.

MANGOSTEEN (GARCINIA MANGOSTANA)

The mangosteen is native of the Malay region. It is a handsome tree twenty-five to thirty feet in height, bearing dense dark green foliage resembling the rubber tree. Its growth is very slow and fruit is not produced for eight to nine years from the seedling stage. In Ceylon the trees flower twice a year, first in August, the fruit ripening in January, and again in January, the fruit ripening in July and August. According to Wright, the January crop yields but 100 fruits to a tree while the August crop yields 500 to 600 fruits to a tree.

The fruit is particularly striking in view of the persistent large leathery light green calyx lobes. It is indescribably delicious in flavor and has been called the "queen of the fruits." The late Queen Victoria valued it so highly as to offer a prize for its first introduction into England from India. The fruit is about the size of a Mandarin orange, round and slightly flattened at each end, with a smooth thick rind, rich purple in color sparsely spotted by hardened drops of the yellow juice. Apparently there is nothing to mar the perfection of the mangosteen unless it is that of the juice of the rind which leaves an objectionable indelible stain.

In the Dutch East Indies the fruit is offered for sale heaped upon baskets or made in long regular bunches braided together with thin strips of bamboo. Upon opening the fruit the coloration and beauty of the individual segments of the pulp attract attention. These five to seven segments, separated by snow-white partitions, are somewhat loosely attached to the rind similarly to the Mandarin orange but covered with a network of delicate fibers. The sides of the segments are translucent and slightly tinged with pale green.

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The texture of the fruit is extremely delicate, suggesting that of a well-ripened plum.

Repeated attempts, up to the present time, to introduce and establish the mangosteen into California and Florida have failed. An importation from Ceylon was received at the Missouri Botanical Garden in 1913, and specimens were planted in the economic and varied industries houses, but without success. The plants grown in the private greenhouse are still growing. Seeds of *Garcinia xanthochymus* were imported from Ceylon and the seedlings raised will be used for inarching the mangosteen. This species is a much stronger plant, adapting itself to various types of soils, and is advocated as an excellent variety for the mangosteen stock. With the successful union of these species there is a possibility of fruiting the mangosteen in the tropical fruit house at the Garden.

NOTES

Mr. L. E. Miles, of the University of Illinois, consulted the mycological herbarium of the Garden, November 28.

Dr. George T. Moore, Director of the Garden, addressed the science section of the Missouri Teachers' Association, at Central High School, November 7, on "The Missouri Botanical Garden as an Educational Institution."

Dr. D. T. MacDougal, Director of Botanical Research, Carnegie Institution of Washington, spent a day at the Garden recently in connection with the arrangements for the meetings of the American Association for the Advancement of Science and affiliated societies, in December.

Mr. G. H. Pring, Floriculturist to the Garden, gave a stereopticon lecture on "The Cultivation of the Cultivated Chrysanthemum" before the St. Louis Association of Gardeners, November 5.

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STATISTICAL INFORMATION FOR OCTOBER, 1919.

GARDEN ATTENDANCE:

Total number of visitors..... 14,161

PLANT ACCESSIONS:

Total number of plants and seeds received as gifts..... 2,236

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	28
Total number of books and pamphlets donated.....	81

HERBARIUM ACCESSIONS:

By Purchase—

F. S. Collins—"Phycotheca Boreali-Americana." Fasc. XLVI, Nos. 2251-2300.....	50

By Gift—

P. J. Anderson—*Stereum Burtianum* Peck.....	1
E. A. Bessey—Fungi of Gogebic County, Michigan.....	116
E. Bethel, by E. B. Payson—Plants of Oklahoma.....	3
Mrs. Adele Lewis Grant—Plants of California.....	9
T. S. Brandegee—*Exothea Copalillo* Radlk. from Mexico	1
H. D. House—*Merulius terrestris* (Pk.) Burt.....	1
L. P. Jensen—White-flowered form of *Verbena hastata* L.	1
E. O. Matthews—*Pleurotus ostreatus* from Texas.....	1
F. L. Stevens—Fungi of Porto Rico.....	124
H. von Schrenk—*Peniophora gigantea*, on railway ties in Arkansas	1

By Exchange—

New York Botanical Garden, by Marshall A. Howe—Hepatics and mosses from various localities.....	195
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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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ST. LOUIS, MO.
1919

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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME VIII

WITH 19 PLATES

1920

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY, EXCEPT JULY AND AUGUST,
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planted, by wrapping them or the entire plant in paper or burlap. Woody plants should be collected during the fall, winter, or early spring months, while in dormant condition.

Hardy herbaceous perennials can be most successfully moved while dormant. However, they may also be transplanted at other times of the year with fair success, if lifted carefully with a lump of earth adhering to their roots, kept moist until planted, and practically all of their leaves removed, to prevent undue evaporation of moisture until the plant is established in its new home. Plants must be watered immediately after transplanting and shaded for a few days.

Plants which are rare in any locality should be moved only by one whose experience will guarantee a successful result, and such plants may generally be purchased from men who make a specialty of growing them, or who are collecting them in other localities where they are plentiful. The scarcity of a plant in a certain section of the country does not always indicate its scarcity in another.

Native plants needing protection.—The following plants, formerly abundant in this vicinity, are becoming very rare, some of them almost, if not entirely, exterminated. For this reason they should not be collected for any purpose whatsoever, but should be left to be admired in their native habitat.

BOTANICAL NAME	COMMON NAME
Amelanchier canadensis	June-berry
Aquilegia canadensis	Columbine
Aster Novae-Angliae	New England aster
Camassia Fraseri	Wild hyacinth
Ceanothus americanus	New Jersey tea
Cornus florida	Flowering dogwood
Cornus paniculata	Panicled dogwood
Cypripedium candidum	Small white lady's slipper
Cypripedium parviflorum	Small yellow lady's slipper
Cypripedium pubescens	Yellow lady's slipper
Dodecatheon Meadia	Shooting-star
Erythronium albidum	White dog's tooth violet
Erythronium americanum	Yellow dog's tooth violet
Euonymus atropurpurea	Strawberry bush
Filices, all species	Ferns
Gentiana, all species	Gentians
Hepatica acutiloba	Sharp-lobed liver-leaf
Hepatica triloba	Round-lobed liver-leaf
Ilex decidua	Winterberry
Iris hexagona	Southern blue flag
Iris versicolor	Large blue flag
Lilium canadense	Wild yellow lily
Lilium philadelphicum	Wood lily
Lilium superbum	Turk's-cap lily
Lobelia cardinalis	Cardinal flower

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Orchis spectabilis.....Showy orchid
Physostegia virginiana.....False dragon-head
Rosa, all species.....Roses
Sabbatia angularis.....Rose pink
Smilacina racemosa.....False Solomon's seal
Trillium grandiflorum.....Large-flowered wake-robin
Verbena canadensis.....Showy verbena
Viola pedata.....Bird's-foot violet

In order that the citizens of St. Louis may be able to make the most intelligent use of native material, lists of the wild plants of the eastern United States suitable for various kinds of planting, will be printed in the BULLETIN during the current year. There will be included lists on native plants for water gardens, native perennials for the hardy border, native hardy vines, native trees and shrubs with conspicuous flowers, fruit, colored bark, or autumn foliage, native trees for streets, and shrubs for streets, parks, and home grounds, native plants for poor soil and smoky, unfavorable city conditions, and native conifers for gardens which are not in the smoky atmosphere of large cities.

NATIVE PLANTS SUITABLE FOR THE GARDENS OF MISSOURI AND ADJOINING STATES

I. NATIVE PLANTS FOR ROCK GARDENS

A rock garden should, in a small way, be a duplication of a natural rocky bank or similar situation where considerable variation in soil and light conditions will permit the growing of a large variety of plants.

In this region the popular notion of confining a rock collection to alpine and other plants of high altitude must be abandoned, as these plants will not stand our changeable climatic conditions. Such plants are well adapted to many of the eastern and northern states, as well as some European countries, and the directions for rock gardens given in various books apply only to those sections. Fortunately the eastern United States is particularly rich in planting materials suitable for rock-garden work, and if only native material or such exotic species as experience has proved of value be used, some very satisfactory results may be obtained.

The purpose of this article is to discuss the native plants exclusively and to include only those which are of compact growth and neat habit, omitting any which spread rapidly underground and are likely to become obnoxious or difficult to eradicate. The plants listed are mostly hardy herbaceous perennials, and the few annuals and biennials are such as

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readily reproduce themselves from seed. A very few low, rock-loving shrubs have also been included.

Many of these plants may be obtained from American nurserymen and collectors, and those not at present offered by the trade will no doubt be available as soon as their value has been demonstrated. Until then they must be collected from their natural haunts, which in itself is a worth-while recreation for the maker of a rock garden.

NATIVE PLANTS SUITABLE FOR THE GARDENS OF MISSOURI AND ADJOINING STATES.

Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3-8 *_Agave virginica_	False aloe	2-6′	Greenish yellow	May-June
8 _Allium stellatum_	Prairie wild onion	8-18″	Rose	July-Aug.
8 _Arabis confinis_	Purple rock-cress	1-3′	White or pink	June-July
8 _Arabis Ludoviciana_	Virginia rock-cress	1-3′	White	March-May
8 _Arabis lyrata_	Lyre-leaved rock-cress	4-12″	Pure white	April-Sept.
8 _Arabis patens_	Spreading rock-cress	1-2′	White	Summer
8 _Arabis perfoliata_	Tower mustard (biennial)		Yellowish-white	May-Aug.
8 _Arenaria stricta_	Rock sandwort (tufted)	6-16″	White	June-July
8 _Asplenium ebeneum_	Spleenwort	8-15″	Fern	
8 _Asplenium Trichomanes_	Maidenhair spleenwort	3-8″	Fern	
9 _Aster linariifolius_	Savory-leaved aster (low, tufted)	6-12″	Violet	July-Oct.
8 _Aster oblongifolius_	Aromatic aster	1-2½′	Violet-purple	Aug.-Oct.
8 _Astragalus distortus_	Bent milk-vetch	8-15″	Purple	March-July
9 _Baptisia bracteata_	Large-bracted wild indigo	1-1½′	Cream	April-May
8 _Ceanothus ovatus_	Smaller red-root (shrub)	1-2′	White	May-June
8 _Cheilanthes lanuginosa_	Woolly lip-fern	6-18″	Fern	
3 _Delphinium tricorne_	Dwarf larkspur	1′	Blue or white	May

*Key to soil conditions:

1. Clay.
2. Clay subsoil.
3. Clay loam.
4. Loam.
5. Leafmold.
6. Gravelly soil.
7. Sandy loam.
8. Disintegrated limestone.
9. Disintegrated flint.

Two or more numbers indicate a combination of soil conditions: for example, 2-4 is loam with a clay subsoil.

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Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3 *Dicentra eximia*	Wild bleeding-heart	1′	Pink	May-Sept.
8 *Draba cuneifolia*	Whitlow grass	4-6″	White	March-April
8 *Echinacea pallida*	Pale purple cone-flower	1-3′	White or pink	July-Oct.
8 *Echinacea paradoxa*	Yellow cone-flower	3′	Yellow	July-Oct.
3 *Galium circaezans*	Wild licorice	1′	White	May-July
3 *Galium concinnum*	Shining bedstraw	6″	White	June-Aug.
3 *Gypsophila muralis*	Low gypsophyll (annual)	4-7″	White	June-Sept.
8 *Heuchera villosa*	Hairy heuchera	1-2′	White	June-Sept.
2 *Hydrangea radiata*	Downy hydrangea (shrub)	1-3′	White	June-July
8 *Hypericum densiflorum*	Bushy St. John's-wort (shrub)	1-3′	Yellow	July-Sept.
8 *Hypericum prolificum*	Shrubby St. John's-wort (shrub)	1-3′	Yellow	July-Sept.
8 *Hypericum sphaerocarpum*	Round-podded St. John's-wort (shrub)	1-2′	Yellow	July-Sept.
8 *Juniperus nana*	Low juniper (evergreen, low, depressed)	18″		
8 *Juniperus Sabina*	Shrubby red cedar (evergreen, procumbent)	4′		
9 *Lechea major*	Hairy pinweed	1-2′	Purplish	July-Aug.
9 *Lechea thymifolia*	Thyme-leaved pinweed	6-2′	Purplish	Aug.-Sept.
9 *Lechea tenuifolia*	Narrow-leaved pinweed	4-10″	Red-purple	July-Aug.
8 *Leavenworthia Michauxii*	Michaux's leavenworthia (tufted)	3-6″	White or purplish	April
9 *Lespedeza repens*	Creeping bush-clover (trailing)		Violet-purple	Aug.-Sept.
8 *Lithospermum canescens*	Hoary puccoon	6-18″	Orange	April-June
8 *Monarda Bradburiana*	Bradbury's monarda	1-2′	Purple	May-July
8 *Oenothera missouriensis*	Missouri primrose	1′	Yellow	May-July
8 *Ophioglossum vulgatum*	Adder's-tongue	2-12″		May-Aug.
8 *Opuntia missouriensis*	Many-spined opuntia (prostrate)		Yellow	May-June
8 *Opuntia Rafinesquii*	Western prickly pear (prostrate)		Yellow	Summer
2 *Panicum virgatum*	Smooth panicum	2-3′	Grass	Aug.-Oct.

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	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
8	*Pellaea atropurpurea*	Cliff-brake	4-12″	Fern	
3	*Phlox stellaria*	Chickweed phlox	3-8″	Pale blue	April-May
3	*Phlox subulata*	Moss pink (matted)	2-6″	Pink, purple, white	April-May
8	*Pimpinella integerrima*	Yellow pimpernel	1-3′	Yellow	May-June
8	*Potentilla tridentata*	Three-toothed cinquefoil	1-12″	White	June-Aug.
8	*Ranunculus Harveyi*	Harvey's buttercup	8-18″	Bright yellow	April-May
8	*Rhus canadensis*	Fragrant sumach (shrub)	3-5′	Yellow	March-April
2	*Ribes gracile*	Missouri gooseberry (shrub)	3-5′	White	May
8	*Rudbeckia fulgida*	Orange cone-flower	1-3′	Yellow, orange base	Aug.-Oct.
8	*Ruellia ciliosa*	Hairy ruellia	1-15″	Blue	June-Sept.
7	*Saxifraga Michauxii*	Michaux's saxifrage	6-20″	White	May-Sept.
7	*Saxifraga virginiensis*	Early saxifrage	1-2′	White or purplish	March-May
3	*Sedum pulchellum*	Widow's cross (trailing)		Rose-purple	May-July
3	*Sedum telephioides*	American orpine (tufted)	1-2′	Purple	Aug.-Sept.
3	*Sedum ternatum*	Wild stone-crop (low, tufted)		White	April-June
4-8	*Selaginella rupestris*	Club moss	6-8″		Spring
3	*Silene pennsylvanica*	Wild pink (tufted)	4-10″	Pink	April-June
7	*Solidago bicolor*	White golden-rod	6″-4′	Yellowish white	July-Sept.
8	*Solidago Drummondii*	Drummond's golden-rod	1-3′	Yellow	Sept.-Oct.
8	*Solidago humilis*	Rock-bank golden-rod	6-18″	Yellow	July-Sept.
9	*Solidago radula*	Rough golden-rod	1-3′	Yellow	Aug.-Sept.
8	*Solidago rupestris*	Rock golden-rod	2-3′	Yellow	Aug.-Sept.
8	*Solidago squarrosa*	Ragged golden-rod	2-5′	Yellow	Aug.-Oct.
7	*Talinum teretifolium*	Fame flower	4-12″	Pink	May-Aug.
8	*Verbena Aubletia*	Large-flowered verbena		Blue, purple	April-June
9	*Viola pedata*	Bird's-foot violet (tufted)	3-10″	Lilac or blue	April-May

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PLANTS GROWING AMONG ROCKS IN MOIST AND SHADY SITUATIONS

	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3	*Allium Schoenoprasum*	Chives	1′	Pink, purple	June-July
8	*Aquilegia canadensis*	Wild columbine	1-2′	Scarlet and yellow	April-July
8	*Arabis laevigata*	Smooth rock-cress	1-3′	Greenish white	April-May
3	*Campanula rotundifolia*	Harebell	6″-2′	Blue	June-Sept.
3	*Camptosorus rhizophyllus*	Walking-leaf	4-9″	Fern	
3	*Corydalis flavula*	Pale corydalis	6-14″	Yellow	May-June
3	*Dentaria diphylla*	Two-leaved toothwort	8-14″	White	April-May
3	*Dentaria heterophylla*	Slender toothwort	10-14″	Light purple	April-May
3	*Dentaria laciniata*	Cut-leaved toothwort	8-15″	White or pink	April-June
3	*Dicentra canadensis*	Squirrel-corn	6-12″	White	May-June
3	*Dicentra Cucullaria*	Dutchman's breeches	5-10″	White	April-May
3	*Dodecatheon Meadia*	Shooting-star	1′	Rose	May-June
3	*Erythronium americanum*	Yellow adder's tongue	6″-1′	Yellow	March-May
3	*Erythronium albidum*	White adder's tongue	6″-1′	White	March-May
2	*Gillenia stipulacea*	American ipecac	2-3′	White	June-July
2	*Gillenia trifoliata*	Bowman's root	2-3′	White or pinkish	May-July
5-8	*Hepatica triloba*	Round-leaved liverleaf	4-6″	Blue, purple, white	March-May
8	*Heuchera americana*	Alum-root	2-3′	Greenish	May-Aug.
8	*Heuchera Rugelii*	Rugel's heuchera	6″-2′	White	July-Sept.
3	*Hypericum cistifolium*	St. John's-wort (shrub)	1-2′	Yellow	July-Sept.
7	*Mitella diphylla*	Mitre-wort	6-18″	White	April-May
3	*Polygala Senega*	Seneca snakeroot	6-12″	White	May-June
3	*Potentilla fruticosa*	Shrubby cinque-foil (shrub)	6-12″	Bright yellow	June-Sept.
8	*Ribes Cynosbati*	Wild gooseberry (shrub)	3-5′	Green	April-June
8	*Sanguinaria canadensis*	Blood-root	6-14″	White	March-April
7	*Saxifraga Forbesii*	Cliff saxifrage	1-3′	White	May
3	*Thalictrum purpurascens*	Purple meadow-rue	2-4′	Purple	May-June
3	*Tiarella cordifolia*	False mitre-wort	6-12″	White	April-May

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	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3	*Trillium erectum*	Ill-scented wake-robin	8-16″	White	April-May
5-3	*Trillium grandiflorum*	Large-flowered wake-robin	6-12″	Pink, white	April-May
3	*Trillium recurvatum*	Prairie wake-robin	6-18″	Purple	April-May
3	*Trillium sessile*	Sessile-flowered wake-robin	4-12″	Purple	April-May
5-3	*Uvularia grandiflora*	Large-flowered bellwort	1-2′	Yellow	April-May
5-3	*Uvularia perfoliata*	Perfoliate bellwort	6-20″	Yellow	April-May
3	*Veratrum Woodii*	False hellebore	2-5′	Purple	June-July
3	*Woodsia obtusa*	Blunt-lobed woodsia	3-6″	Fern	

PLANTS GROWING IN DRY, SANDY, SUNNY SITUATIONS

7	*Arenaria caroliniana*	Pine-barren sandwort	4-10″	White	May-July
3	*Ascyrum Crux-Andreae*	St. Andrew's cross (shrub)	5-10″	Bright yellow	July-Aug.
3	*Ascyrum stans*	St. Peter's-wort	1-2′	Bright yellow	July-Aug.
3	*Aster gracilis*	Graceful aster	1-2′	Violet	July-Sept.
3	*Centrosema virginianum*	Spurred butterfly-pea (trailing)		Violet	July-Aug.
7	*Hypericum nudicaule*	Orange-grass (annual)	4-20″	Yellow	June-Oct.
3	*Lupinus perennis*	Wild lupine	1-2′	Blue	May-June
7	*Oenothera sinuata*	Evening primrose	6-18″	Yellow	May-June
8	*Tragia nepetaefolia*	Catnip tragia	6-15″	Greenish	May-Oct.
9	*Vaccinium vacillans*	Low blueberry (shrub)	1-3′	White	May-June

The list above enumerates only plants which actually prefer rocky situations for their growth, and many of these will not succeed elsewhere. These do not, however, exhaust the available native material for rock-garden purposes, and the following list includes a large number of beautiful plants which, while not actually growing in rocky situations, are still suitable for a rock garden.

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PLANTS GROWING IN DRY SOIL IN SUNNY SITUATIONS

	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3	*Anemone cylindrica*	Long-fruited anemone	2′	Greenish white	June-Aug.
3	*Antennaria plantaginifolia*	Plantain-leaf everlasting	6-18″	Greenish white	April-June
7	*Arenaria patula*	Sandwort (annual)	4-10″	White	April-May
8	*Asclepias tuberosa*	Butterfly-weed	1-2′	Orange	June-Sept.
8	*Asclepias verticillata*	Whorled milkweed	1-2′	White	July-Sept.
8	*Aster laevis*	Smooth aster	2-3′	Blue-violet	Sept.-Oct.
3	*Aster multiflorus*	Dense-flowered aster	1-3′	White	Aug.-Nov.
3	*Aster patens*	Late purple aster	1-3′	Purplish blue	Aug.-Oct.
3	*Aster turbinellus*	Prairie aster	2-3′	Violet	Sept.-Oct.
3	*Baptisia leucantha*	Large white wild indigo	2-3′	White	June-July
3	*Baptisia tinctoria*	Wild indigo	1-2′	Yellow	June-Sept.
3	*Cassia nictitans*	Wild sensitive plant	6-15″	Yellow	July-Oct.
3	*Clitoria Mariana*	Butterfly-pea	1′	Pale blue	June-July
3	*Crassina grandiflora*	Prairie zinnia	4-6″	Yellow	
3	*Croton capitatus*	Capitate croton (annual)	1-1½′	Silvery	June-Sept.
3	*Croton monanthogynus*	Single-fruited croton (annual)	4-8″	Silvery	
3	*Euphorbia corollata*	Flowering spurge	10″-3′	White	April-Oct.
3	*Gnaphalium polycephalum*	Sweet balm (annual)	1-3′	White	Aug.-Sept.
3	*Helianthus occidentalis*	Sunflower	2-3′	Yellow	Aug.-Sept.
9	*Hieracium Gronovii*	Hairy hawkweed	1-3′	Yellow	July-Sept.
9	*Hypoxis erecta*	Star-grass	2-6″	Yellow	May-Oct.
9	*Lespedeza procumbens*	Trailing bush-clover (low, trailing)	1-3′	Violet or pink	Aug.-Sept.
9	*Lespedeza violacea*	Bush-clover	1-3′	Violet-purple	Aug.-Sept.
3	*Liatris cylindracea*	Cylindric blazing-star	1-1½′	Purple	July-Sept.
8	*Liatris punctata*	Dotted button-snakeroot	6-30″	Purple	Aug.-Oct.
9	*Liatris scariosa*	Large button-snakeroot	1-6′	Bluish purple	Aug.-Sept.
8	*Liatris squarrosa*	Blazing-star	6″-2′	Bright purple	June-Sept.

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Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3 *Liatris elegans*	Handsome blazing-star	2-3′	Rose	Aug.-Oct.
3 *Liatris graminifolia*	Loose-flowered button-snakeroot	1-3′	Purple	Aug.-Sept.
3 *Melampodium cinereum*	Pale melampodium	4-12″	White	June-Oct.
3 *Oenothera triloba*	Three-lobed primrose	3-12″	White or pink	May-July
3 *Phlox amoena*	Hairy phlox	6-18″	Pink or white	April-May
3 *Phlox pilosa*	Downy phlox	1-2′	Pink, purple or white	April-May
3 *Potentilla argentea*	Samson's snakeroot		Blue-purple	March-July
3 *Psoralea melilotoides*	Silvery cinque-foil (low, tufted)	1-2′	Yellow	May-Sept.
3 *Salix tristis*	Dwarf gray willow (shrub)	2-3′	Inconspicuous	March-April
3 *Schrankia uncinata*	Sensitive briar	2-4′	Pink	May-July
3 *Scutellaria resinosa*	Resinous skullcap	6-10″	Violet	May-Aug.
3 *Solidago nemoralis*	Field golden-rod	6″-2′	Yellow	July-Nov.
3 *Solidago petiolaris*	Downy golden-rod	1-3′	Yellow	Sept.-Oct.
3 *Viola palmata*	Early blue violet (low, tufted)		Blue	April-May

PLANTS GROWING IN DRY SOIL IN SHADY SITUATIONS

8 *Blephilia ciliata*	Downy blephilia	1-2′	Purple	June-Aug.
9 *Ceanothus americanus*	New Jersey tea (shrub)	1-3′	White	May-July
9 *Cunila Mariana*	Stone mint	8-20″	Purple-pink	Aug.-Sept.
3 *Iris cristata*	Crested dwarf iris	1-3″	Blue	April-May
3 *Iris verna*	Dwarf iris	1-3″	Yellow	April-May
3 *Pedicularis canadensis*	Lousewort	6-18″	Yellow or reddish	April-June
3 *Pentstemon pubescens*	Beard-tongue	1-2′	Purple	May-July
4 *Viola pubescens*	Hairy yellow violet (low, tufted)		Yellow	April-May

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PLANTS GROWING IN MOIST SITUATIONS IN OPEN SUNNY PLACES

Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
8 *Aconitum noveboracense*	New York monk's-hood	2′	Blue	May-June
3 *Anemone pennsylvanica*	Canada anemone	1-2′	White	May-Aug.
3 *Baptisia australis*	Blue false-indigo	1-3′	Blue	June-Aug.
3 *Commelina virginica*	Virginia day-flower	3′	Blue	June-Sept.
8 *Echinacea purpurea*	Purple cone-flower	2-4′	Purple	July-Oct.
3 *Eryngium yuccaefolium*	Button snake-root	2-4′	Blue	June-Sept.
3 *Eupatorium coelestinum*	Mist-flower	1-2′	Blue	Aug.-Oct.
3 *Helenium autumnale*	False sunflower	2-3′	Yellow	Aug.-Oct.
3 *Helenium nudiflorum*	Sneeze-weed	1-3′	Yellow	June-Oct.
7 *Krigia Dandelion*	Goat's-beard	6-18″	Yellow	April-June
7 *Krigia virginica*	Virginia goat's-beard	1-2′	Reddish orange	May-Oct.
8 *Liatris spicata*	Dense button-snake-root	2-3′	Blue-purple	Aug.-Sept.
3 *Mikania scandens*	Climbing hemp-weed (climber)		Flesh-color	July-Sept.
1-3 *Phlox divaricata*	Wild blue phlox (low, creeping)		Bluish	April-June
3 *Sabbatia angularis*	Rose pink (annual)	1′	Rose-pink or white	June-July
3 *Polygala sanguinea*	Purple milkwort	6-15″	Rose-purple	June-Sept.
3 *Potentilla Anserina*	Silver-weed (low, tufted, spreading)		Yellow	May-Sept.
8 *Scutellaria parvula*	Small skullcap	3-12″	Violet	April-June
3 *Thalictrum polygamum*	Tall meadow-rue	3′	White	May-June
3 *Thaspium barbinode*	Meadow parsnip	1-2′	Yellow	May-June
3 *Tradescantia virginiana*	Spiderwort	8″-3′	Blue	May-Aug.
3 *Trifolium reflexum*	Buffalo clover	10-20″	White	April-Aug.
9 *Vaccinium corymbosum*	Swamp blueberry	1-3′	White	May-June
3 *Viola sagittata*	Arrow-leaved violet (tufted, low)		Blue	April-May
3 *Zizia aurea*	Golden meadow parsnip	1-2½′	Yellow	April-July

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PLANTS GROWING IN RICH SOIL AND DRY, SUNNY SITUATIONS

Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
9 *Amorpha canescens*	Lead plant (shrub)	1-3′	Blue	July-Aug.
3 *Amorpha nana*	Fragrant false indigo (shrub)	1′	Purple	May
3 *Anemone caroliniana*	Carolina anemone	3-6″	Purple	May
3 *Astragalus caryocarpus*	Ground plum	6-15″	White	April-June
3 *Astragalus mexicanus*	Larger ground plum	6-15″	Yellowish white	May
3 *Camassia Fraseri*	Wild hyacinth	1-2′	Blue-white	April-May
3 *Coreopsis palmata*	Stiff tickseed	1-3′	Bright yellow	June-July
3 *Delphinium carolinianum*	Carolina larkspur	1-2′	Blue-white	May-July
8 *Draba cuneifolia*	Wedge-leaved Whitlow-grass	4-8″	White	Feb.-April
3 *Erigeron bellidifolius*	Robin's plantain	10-24″	Violet, purple	April-June
8 *Erysimum asperum*	Western wall-flower	1-3′	Orange-yellow	May-July
3 *Gentiana puberula*	Gentian	6-10″	Lilac	Aug.-Sept.
8 *Houstonia angustifolia*	Narrow-leaved houstonia	1-2′	Purplish	May-July
3 *Houstonia caerulea*	Bluet	3-5″	Blue	March-May
3 *Houstonia minima*	Bluet	1-4″	Blue	March-July
3 *Houstonia purpurea*	Large houstonia	8-15″	Blue	May-July
3 *Liatris pycnostachya*	Hairy button-snake-root	2-5′	Purple	Aug.-Sept.
3 *Linum perenne*	Flax	1-2′	Blue	Summer
3 *Lupinus argenteus*	Silvery lupine	1-2′	Purple	July-Aug.
3 *Malvastrum coccineum*	False mallow	4-10″	Red	May-Aug.
3 *Mentzelia nuda*	Bractless mentzelia	1-5′	Yellowish white	July-Aug.
3 *Mentzelia ornata*	Ornate mentzelia	2′	Yellowish white	June-Sept.
3 *Nothoscordum striatum*	Yellow false garlic	1′	Yellow	March-July
3 *Oenothera albicaulis*	Prairie evening primrose (low, spreading)		White, pink	April-June

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	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3	*Oenothera speciosa*	Showy primrose	6"-3'	White, pink	May-July
3	*Parosela aurea*	Golden parosela	1-2'	Yellow	Summer
3	*Parosela Dalea*	Pink parosela	1-2'	Pink	Aug.-Sept.
3	*Petalostemon candidus*	White prairie clover	2-3'	White	July-Aug.
3	*Petalostemon villosus*	Hairy prairie clover	1-2'	Purple	Aug.
3	*Petalostemon violaceus*	Violet prairie clover	1-3'	Violet, purple	July-Aug.
3	*Sabbatia campestris*	Rose pink	1'	Lilac	July-Aug.
8	*Silene regia*	Royal catchfly	3-4'	Scarlet	July
3	*Sisyrinchium angustifolium*	Pointed blue-eyed grass	3-12"	Blue	May-Aug.

PLANTS GROWING IN RICH SOIL AND MOIST, SHADY SITUATIONS

3	*Aconitum uncinatum*	Wild monkshood	1-2'	Blue	June-Sept.
4-8	*Actaea alba*	White baneberry (berries white)	1-2'	White	April-June
8	*Actaea rubra*	Red baneberry (berries red)	1-2'	White	April-June
3	*Anemone virginiana*	Tall anemone	2-3'	White	June-Aug.
5-3	*Anemonella thalictroides*	Rue anemone	4-9"	White, pinkish	March-June
8	*Arabis canadensis*	Sickle-pod	1-3'	Greenish white	June-Aug.
5-3	*Aralia quinquefolia*	Ginseng	8-15"	Greenish white	July-Aug.
5-3	*Arisaema triphyllum*	Jack-in-the-pulpit	1'	Greenish brown	April-June
5-8	*Asarum canadense*	Wild ginger (low, prostrate)		Brown	May-June
5-3	*Botrychium virginianum*	Virginia grape fern		Fern	
8	*Cimicifuga racemosa*	Black snakeroot	3-5'	White	June-Aug.
3	*Claytonia caroliniana*	Carolina spring-beauty	6-12"	Pink	March-May
3	*Claytonia virginica*	Spring-beauty	6-12"	Pink	March-May
3	*Clethra alnifolia*	Sweet pepperbush (shrub)	3-10'	White	July
3	*Corydalis aurea*	Golden corydalis	6-14"	Bright yellow	March-May
3	*Erythronium albidum*	White adder's-tongue	6-18"	White	March-May

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	Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom
3	*Euonymus obovatus*	Running strawberry bush (low, trailing shrub)		Greenish	April-May
3	*Geranium maculatum*	Wild cranesbill	1-2′	Rose-purple	April-July
3	*Hydrastis canadensis*	Golden seal	1′	Greenish white	April-May
5-3	*Hydrophyllum virginicum*	Virginia waterleaf	1-3′	White	May-Aug.
8	*Osmorrhiza brevistylis*	Woolly sweet cicely	1-3′	White	May-June
8	*Osmorrhiza longistylis*	Smooth sweet cicely	1-3′	White	May-June
3	*Polemonium reptans*	Greek valerian	1′	Blue	April-May
3	*Polygonatum biflorum*	Hairy Solomon's seal	8″-3′	White	April-June
3	*Polygonatum giganteum*	Smooth Solomon's seal	1-5′	White	May-July
3	*Scutellaria versicolor*	Small skullcap	1-3′	Blue	June-Aug.
3	*Smilacina racemosa*	Wild spikenard	1-2′	White	May-June
3	*Solidago latifolia*	Broad-leaved golden-rod	1-3′	Yellow	July-Sept.
3	*Spiraea Aruncus*	False goat's-beard	3-5′	Yellowish white	June
3	*Thalictrum dioicum*	Early meadow rue	1-2′	Greenish	April-May
3	*Thaspium aureum*	Meadow parsnip	1-2′	Yellow	June-July
3	*Viola striata*	Pale violet (tufted)	6″	Cream-white	April-May
8	*Zizia cordata*	Heart-leaved alexanders	2-3′	Yellow	May-June

FLOWER SHOW OF THE GARDEN CLUB OF ST. LOUIS

The first annual flower show of the Garden Club of St. Louis will be held in the floral display house in the Missouri Botanical Garden, Tower Grove Avenue at Flora Boulevard, Saturday and Sunday, May 15 and 16, 1920. For the first time, the floral display house will be artificially lighted, so that those who cannot come in the day time may visit the show at night.

A cordial invitation is hereby extended to everybody and anybody living in St. Louis, St. Louis County, and the territory within a radius of twenty-five miles of the St. Louis Court House, to take part in this show. Any one who has flowers, flowering shrubs or trees, small fruits or vegetables

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which he has grown himself, is invited to bring these to Shaw's Garden and exhibit them at this show and compete for the prizes offered.

There will be two classes of exhibits, one for amateurs and one for commercial growers.

The different exhibits will include cut perennials and perennials in pots, cut annuals, annuals in pots, house plants, vegetables, flowering shrubs and trees, wild flowers, etc. Any one may exhibit as many different plants or cut flowers as he desires. There will be no charge for space or admission. The object of this show is to create interest and enthusiasm in plants and flowers in St. Louis and vicinity. Few realize that a great variety of plants can be grown with success in this region, and it is hoped that everybody will help make this show worth visiting.

Every person desiring to exhibit should obtain an entry blank and exhibit tags for each variety to be shown. Exhibit blanks, tags, and premium list containing full information can be obtained by writing to Mrs. E. J. Walsh, Chairman Entry Committee, 4349 Westminster Place, St. Louis, Mo. The entry blank, properly filled out, should be returned to Mrs. Walsh. The tags are to be retained by the exhibitor and securely fastened to the exhibit.

Such shows have been held with great success in the east, and it is the intention, if enough interest is aroused, to make this spring flower show an annual event. The Missouri Botanical Garden is glad to co-operate in every way possible to make these exhibits a regular feature of the life of the city.

NOTES.

Mr. S. H. Essary, of the Tennessee Agricultural Experiment Station, spent a few days at the Garden recently, consulting the library.

Mrs. Adele Lewis Grant, Teaching Fellow in the Henry Shaw School of Botany, lectured before Asclepios, the biological society of Washington University, March 23, on "The Economic Value of Some of Our Summer Birds."

Mr. and Mrs. C. W. Deusner, the former a graduate of the School for Gardening, have resumed the practice of landscape gardening in southern California, with an office at Pasadena.

Mr. D. Miller and Mr. Adam Huber, orchid growers at the Garden, gave a talk on "Orchids," March 3, before the St. Louis Association of Gardeners.

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Mr. Willard G. Bixby, Secretary of the Northern Nut Growers' Association, visited the Garden, March 24, inspected the nut plantation, and presented the Garden with several new abnormalities of nuts.

Volume VI, Number 4 of the Annals of the Missouri Botanical Garden has recently been issued with the following contents:

"The Thelephoraceae of North America. XI," E. A. Burt.

"A Subterranean Algal Flora," George T. Moore and Joanne L. Karrer.

"Culture Experiments with Melampsora in Japan," Takashi Matsumoto.

STATISTICAL INFORMATION FOR FEBRUARY, 1920

GARDEN ATTENDANCE:

Total number of visitors	9,041

PLANT ACCESSIONS:

Total number of plants and seeds received as gifts	15

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	39
Total number of books and pamphlets donated	143

HERBARIUM ACCESSIONS:

By Purchase—

E. Bartholomew—"North American Uredinales," Cent. XXII and XXIII, Nos. 2101-2300 inclusive	200
C. Mereschkovsky—"Lichenes ticinenses exsiccati"	100

By Gift—

J. S. Boyce—*Merulius* sp.	2
Miss Fanny Goetz—*Mimulus modestus* Eastw. from California	1
Mrs. Adele Lewis Grant—*Mimulus*, several species from California	15
Dr. D. T. MacDougal—*Chenopodium ambrosioides* L. from the vicinity of the Mexican boundary	1
W. H. Snell—*Merulius* sp. from California	2
W. N. Suksdorf—Plants of Washington	112
Dr. S. M. Zeller—*Poria* sp.	1

By Exchange—

Ira W. Clokey—Plants of Colorado	270
U. S. National Museum—"American Grasses" Nos. 401-700 inclusive	300
Total	1,004

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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Mr. H. H McKinney, Cereal Pathologist, United States Department of Agriculture, who is working on the new wheat disease prevalent in the Illinois bottoms, spent a couple of days at the Garden recently

The annual report of the director of the department of botanical research, Carnegie Institution of Washington, contains three short reports by Dr. B. M. Duggar, Physiologist to the Garden, covering the work done by him at the Coastal Laboratory, Carmel, Cal.

STATISTICAL INFORMATION FOR APRIL, 1920

GARDEN ATTENDANCE:

Total number of visitors	14,413

PLANT ACCESSIONS:

Total number of packets of seed received in exchange	282
Total number of plants received in exchange	865

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	20
Total number of books and pamphlets donated	238

HERBARIUM ACCESSIONS:

By Gift—	
Prof. E. Bethel—Specimens of *Lesquerella* and *Physaria* from Colorado	6
Ira W. Clokey—Fragment of type of *Dithyrea clinata* Macbride & Payson	1
Mrs. Adele Lewis Grant—*Mimulus* from California	16
M. M. High—Plants of Texas	60
C. G. Lloyd—*Stereum occidentale* Lloyd, and *Polyporus* sp.	2
Prof. Aven Nelson—Specimens of *Lesquerella* from Utah	2
Dr. L. O. Overholts—*Stereum rugisporum* from Colorado	1
Prof. C. V. Piper—Specimens of *Senecio* from Mt. Rainier, Washington	4
University of Wisconsin—Fungi of Wisconsin	10
By Exchange—	
Bureau of Science, Manila, P. I.—Fungi of the Philippine Islands	153
Total	255

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The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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1920

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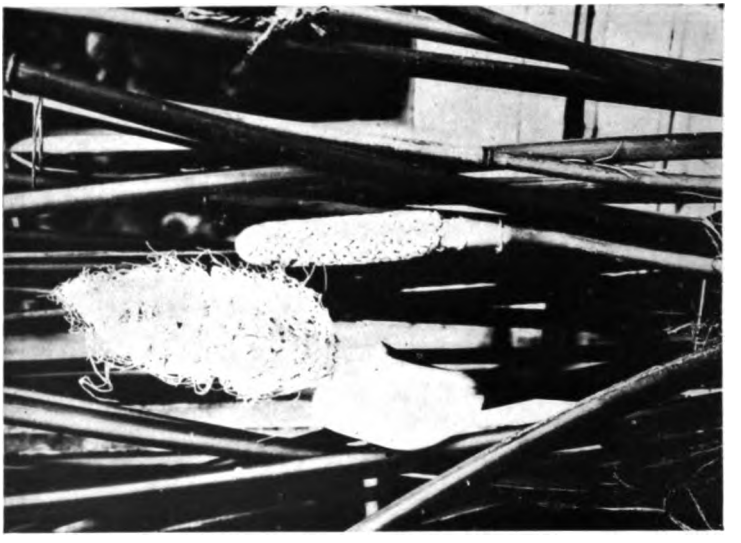

FLOWER STALK OF PANAMA-HAT PALM.

SPECIMEN OF PANAMA-HAT PALM AT THE GARDEN.

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Missouri Botanical Garden Bulletin

Vol. VIII St. Louis, Mo., November, 1920 No. 9

HATS FROM PLANTS

Of the many economic uses to which plants are put, one of the oldest is the manufacture of hats. The fibers obtained from the stem and leaves of many tropical and subtropical grasses and palms lend themselves admirably for this purpose, and primitive races long ago recognized the value of such material for the making of hats as well as other articles of clothing. Most of the plants which have been used for hat making are included in the Garden collection, and those in the following list marked with an asterisk may be found in either the economic garden or among the exotic plants in the Garden greenhouses.

GRASSES

The order Gramineae, noteworthy for its many edible products such as wheat, barley, rice, corn, sugar, etc., possesses many plants used in the manufacture of both hats and paper.

*The sugar cane *(Saccharum officinarum)* occurs both wild and cultivated throughout tropical and subtropical Asia. Its cultivation extended to Persia in the early Middle Ages and was carried by the Arabs into Sicily, Cyprus, Spain and Italy. The plant soon became widely known for its economic products and by the sixteenth century had been introduced into the New World. At the present time it is grown commercially in the West Indies, Mauritius, British Guiana, Cuba, Natal, Australia, Java, India, southern United States, and the Philippines. In Europe it is successfully cultivated only in Malaga, Spain. In Tahiti and the Islands of Samoa the long slender leaves are used in making hats similar in shape to the common stiff straw hats.

*The esparto grass *(Stipa tenacissima)* is a native of Spain, Italy and northern Africa. It was used by the Romans for cordage and is now employed in hat and paper making. In

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Italy and Portugal hats from this material are made with an extremely large brim, the width of which equals the height of the crown.

*The dog's-tail grass *(Cynosurus cristatus)* is native of Europe and naturalized in North America. It is one of the short spike grasses incorporated in grass mixtures for lawns and pastures. Straw made from the stem and leaves has been braided and made into hats. In the earlier days hats of this type were made in Northumberland, England, being worn by the shepherds. The peasants of Wexford, Ireland, used this grass either dyed or plain for mat and basket making.

*Uva grass *(Gynerium saccharoides)* is a native of the tropics where it grows to a height of 40–80 feet. In Dominica and the Rio Casiquiare the natives make hats by braiding and sewing together the long thin split fibers of the leaves, these hats being remarkable for their lightness. The flower stalks have been employed by the Indians of the Rio Negro for making the shafts of poisoned arrows used for spearing fish.

The tribe Hordeae which includes wheat, barley, rye, etc., furnishes the straw for making American and European hats. *Triticum tenax* is used principally for hats worn by seamen. The straw is extremely tough and when covered with a water-resisting cloth makes a very durable head-covering. In China and Japan hats are made from the wheat straw, *Triticum vulgare,* the shape suggesting the steel helmets worn by the American and English soldiers during the late war. The prepared straw which is braided is exported in large quantities to this country and Europe where it is eventually made into hats. In Florence, Italy, *Triticum vulgare* var. *aestivum* is a favorite hat material. In Portugal the hat-making industry is given over to prisoners.

BAMBOO

*The giant bamboo *(Bambusa arundinacea)* is a native of India where it grows to a height of 60 feet. The canes or stems are split into long fibers and used by the natives in the manufacture of hats. The seed is eaten by the poorer classes as a substitute for rice or millet and is commonly called by them bamboo rice. The stems, which frequently measure 10 inches to one foot in diameter, are used as flower pots. For this purpose the elongated stems are cut below the nodes, the joint or node constituting the bottom of the pot. In Corea the canes are split as fine as thread and used by the High Mandarins for making sun blinds. In India the young succulent shoots are prepared into delicate pickle. Two large speci-

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men bamboo plants towering to a height of 40 feet form an arch in the north end of the palm house at the entrance to the fern house, the oldest cane measuring four inches in diameter.

PALMS

*The date palm *(Phoenix dactylifera)* is widely spread over southern Europe, northern Africa, and southeastern Asia, where it grows to a height of from 40 to 80 feet. Apart from the value of the fruits and fiber as food, the leaves are used by the Bedouin women for making hats. The date palm is cultivated in Bordighera exclusively for the leaves which are used as a decoration in church festivals. For this purpose the young growths are blanched by being tied together in bundles.

*The Chinese fan palm *(Livistona chinensis)* is also used for decoration and may be seen in the Catholic churches on Palm Sunday. The large fan-shaped leaves with the divided ends are collected, the inner portion being made into fans and the remaining portion blanched and used in festivals. The Garden has frequently supplied young leaves of the fan palm for Jewish festivals in this city when other sources of supply have failed.

*Coir palm *(Trachycarpus excelsa)* is a native of China and Japan. The dense fibers surrounding the leaves, as well as the leaves themselves, are used by the Chinese and Japanese in making hats. In shape these are entirely different from those made of bamboo, having a short conical crown, with a tassel made from the trunk fibers, and a very short, turned-up brim.

*The Bermuda palm *(Sabal Blackburniana)* is a native of the West Indies where it is commonly called the giant fan palm. The leaves are stripped of the fibrous portion and made into hats by the natives. The leaves are also used as shingles on the native huts.

*The dwarf fan palm *(Chamaerops humilis)* is a native of southern Europe where it rarely reaches a height of 20 feet. In Sicily the leaves are finely split and made into hats. The finished product is a rather rough, dirty yellow straw and resembles in shape the old-fashioned shepherd's hat of England. In Arabia the fibers are split to a finer degree, the hat presenting a smoother finish and also a lighter color.

The double cocoanut palm *(Lodoicea sechellarum)* is a native of the Seychelles Islands where it attains a height of from 50 to 100 feet. Before the discovery of these islands the large twin nuts were occasionally found floating in the

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Indian Ocean. In view of the mystery of their origin large sums were frequently paid to sailors bringing them back as curios. The leaves, which are semi-fan-shaped, are used by the natives for hat-making and are exported to Europe in large quantities for the same purpose.

The palmyra palm *(Borassus flabelliformis)* is a native of tropical Africa and widely cultivated in India. The young leaves are used as a vegetable in Africa and India, and in the latter country the young leaves, or the cuticle, are collected for making hats.

The raffia palm *(Raphia Ruffia)* is a valuable palm native of Madagascar and cultivated in various parts of the tropics for the fiber obtained from its leaves. This is obtained by removing the cuticle or the superficial layer. The fiber is exported in large quantities and used for various purposes, such as mats, baskets, tying garden plants, etc. The natives use the fibers from both the trunk and leaves for making hats.

*Silver thatch palm *(Thrinax argentea)* is a dwarf palm, native of the West Indies where it grows to a height of 20 feet. The leaves are fan-shaped, pure white on the under side. The plants are grown in Cuba for the fiber stripped from the leaves, this fiber being imported into the United States and England in large quantities for making hats. Young plants are grown by the florists as decorative house plants.

Unlike most palms, the malacca cane *(Calamus Scipionum)* is a climber, often having stems 400 feet long encircling trunks of trees. The stems, or so-called canes, are exported in large quantities from Siak. They are used for making walking sticks, umbrella staves and handles, and, to a great extent in Europe, for handles of chimney sweepers' brushes, etc. In Manila the split canes are made into the well-known Manila hats.

*The panama-hat palm *(Carludovica palmata)* is a stemless pseudo-palm indigenous to the shady deep forests of Ecuador, Peru, etc. It is the most important species economically of the Cyclanthaceae, as it furnishes the fiber for the well-known panama hats. For this important industry the leaves are gathered in the young state just before they assume a green color. They are cut into narrow strips and the stiff veins removed while still attached to the petiole or leaf-stalk. They are then bleached by immersion successively in boiling water, in water acidulated with lemon juice, and finally in pure cold water. After this preparation the straw is ready for being made into the well-known panama hats. Hats of superior quality are said to be plaited from a single leaf without a break.

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NATIVE PLANTS SUITABLE FOR THE GARDENS OF MISSOURI AND ADJOINING STATES

XI. NATIVE TREES ARRANGED ACCORDING TO FORM OF OUTLINE

The following list is given as an aid to those who wish to arrange the trees in their plantations according to form of general outline. The letters preceding the names indicate the general effect of the tree with mature leaves, D meaning dark, M, medium, and L, light.

1. LARGE TREES OF SOMEWHAT FORMAL SHAPE

	Botanical name	Common name
	SPECIMEN TREES	
M	*Aesculus glabra*	Ohio buckeye
D	*Aesculus octandra*	Yellow buckeye
D	*Acer nigrum*	Black sugar maple
L	*Acer rubrum*	Red maple
D	*Acer saccharum*	Sugar maple
D	*Celtis mississippiensis*	Southern hackberry
L	*Fagus americana*	American beech
D	*Fraxinus nigra*	Black ash
D	*Fraxinus pennsylvanica*	Red ash
L	*Fraxinus quadrangulata*	Blue ash
D	*Fraxinus viridis*	Green ash
D	*Liquidambar Styraciflua*	Sweet gum
L	*Liriodendron Tulipifera*	Tulip tree
L	*Nyssa sylvatica*	Tupelo
D	*Quercus coccinea*	Scarlet oak
D	*Quercus imbricaria*	Shingle oak
	TREES FOR MASS PLANTING	
L	*Acer Drummondii*	Drummond's maple
L	*Carya alba*	Mocker nut
L	*Carya illinoensis*	Pecan
L	*Carya glabra*	Pignut
L	*Carya laciniosa*	Big shell-bark
L	*Carya ovata*	Shell-bark hickory
L	*Diospyros virginiana*	Persimmon
L	*Gleditsia aquatica*	Swamp locust
D	*Juglans cinerea*	Butternut
D	*Populus alba*	Silver poplar
M	*Quercus minor*	Post oak
D	*Quercus velutina*	Quercitron
L	*Robinia Pseudacacia*	Common locust
M	*Sassafras officinalis*	Sassafras
D	*Tilia heterophylla*	White basswood
D	*Tilia pubescens*	Southern basswood

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2. SMALL TREES OF SOMEWHAT FORMAL SHAPE

	Botanical name	Common name
	SPECIMEN TREES	
L	*Carpinus caroliniana*	American hornbeam
D	*Cercis canadensis*	Redbud
D	*Crataegus cordata*	Washington thorn
L	*Crataegus macracantha*	Long-spined thorn
L	*Crataegus punctata*	Large-fruited thorn
D	*Oxydendron arborea*	Sorrel tree
D	*Planera aquatica*	Planer tree
D	*Prunus americana*	Wild red plum
	TREES FOR MASS PLANTING	
L	*Amelanchier canadensis*	Juneberry
D	*Asimina triloba*	Papaw
L	*Bumelia lycioides*	Southern buckthorn
L	*Cornus florida*	Flowering dogwood
D	*Crataegus Crus-galli*	Cockspur thorn
D	*Prunus pennsylvanica*	Wild red cherry
M	*Pyrus angustifolia*	Narrow-leaved crab-apple
M	*Pyrus coronaria*	American crab-apple
M	*Pyrus ioensis*	Western crab-apple
L	*Rhus cotinoides*	American smoke-tree
M	*Robinia viscosa*	Clammy locust
D	*Viburnum Lentago*	Nanny-berry

3. LARGE GRACEFUL TREES

	Botanical name	Common name
	TREES FOR MASS PLANTING	
D	*Betula lenta*	Black sweet birch
L	*Betula lutea*	Yellow birch
M	*Betula nigra*	River birch
L	*Betula papyrifera*	Paper birch
M	*Betula populifolia*	American white birch
D	*Prunus serotina*	Wild black cherry
M	*Salix nigra*	Black willow
D	*Ulmus alata*	Winged elm
D	*Ulmus americana*	White elm
D	*Ulmus fulva*	Slippery elm
D	*Ulmus racemosa*	Cork elm

4. LARGE, SPREADING, PICTURESQUE TREES

	Botanical name	Common name
	SPECIMEN TREES	
M	*Castanea dentata*	American chestnut
L	*Cladrastis tinctoria*	Yellow-wood

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	Common name	Botanical name
L	*Platanus occidentalis*	Sycamore
L	*Quercus acuminata*	Chinquapin oak
L	*Quercus alba*	White oak
L	*Quercus macrocarpa*	Bur oak
L	*Quercus platanoides*	Swamp white oak

TREES FOR MASS PLANTING

L	*Acer Negundo*	Box elder
L	*Catalpa bignonioides*	Indian bean
L	*Catalpa speciosa*	Large Indian bean
D	*Celtis occidentalis*	Hackberry
D	*Gleditsia triacanthos*	Honey locust
D	*Gymnocladus canadensis*	Kentucky coffee tree
M	*Juglans nigra*	Black walnut
L	*Populus deltoides*	Cottonwood
L	*Populus tremuloides*	American aspen
D	*Quercus palustris*	Pin oak
D	*Quercus Phellos*	Willow oak
M	*Tilia americana*	American linden

5. SMALL, SPREADING, PICTURESQUE TREES

	Botanical name	Common name
L	*Crataegus coccinea*	Red haw
L	*Crataegus mollis*	Red-fruited thorn
L	*Halesia tetraptera*	Silver bell
L	*Magnolia glauca*	Sweet bay
L	*Morus rubra*	Red mulberry
D	*Sapindus marginatus*	Soapberry

6. LARGE, CONICAL TREES

	Botanical name	Common name
M	*Taxodium distichum*	Bald cypress
M	*Magnolia acuminata*	Cucumber tree
M	*Magnolia tripetala*	Umbrella tree

XII. TREES FOR STREET AND AVENUE PLANTING

Botanical name	Common name
STREET TREES FOR SMOKY CITY CONDITIONS	
Acer saccharinum	Soft or silver maple
Fraxinus americana	White ash
Fraxinus viridis	Green ash
Gleditsia triacanthos	Honey locust
Platanus occidentalis	Sycamore
Populus deltoides	Cottonwood

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Common name	Botanical name
STREET AND AVENUE TREES FOR SECTIONS NOT AFFECTED BY SMOKE	
The above and	
Acer rubrum	Red maple
Catalpa speciosa	Large Indian bean
Celtis occidentalis	Hackberry
Liquidambar Styraciflua	Sweet gum
Liriodendron tulipifera	Tulip tree
Prunus serotina	Wild black cherry
Quercus alba	White oak
Quercus coccinea	Scarlet oak
Quercus imbricaria	Shingle oak
Quercus palustris	Pin oak
Quercus rubra	Red oak
Tilia americana	American linden
Ulmus americana	White elm

NOTES

Dr. C. A. Weatherby, of Hartford, Connecticut, spent a day in the herbarium recently.

Dr. B. M. Duggar, Physiologist to the Garden, spoke before the Town and Gown, October 15, on "The Japanese Problem in California," and before the St. Louis Florists' Club, November 3, on "Mushrooms, Native and Cultivated."

Dr. Hermann von Schrenk, Pathologist to the Garden, addressed the American section of the Society Chemical Industry, at the Chemists' Club, New York, November 12, on "The Preservative Treatment of Wood, Its Broader Aspects and Some of Its Technical Phases."

Recent visitors to the Garden include Dr. Keita Shibata, Professor of Botany, Tokyo Imperial University, Tokyo, Japan, October 26; Mr. David G. Fairchild, Agricultural Explorer in charge of Foreign Seed and Plant Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C., November 13; Dr. Bohumel Shimek, of Iowa State University, Iowa City, Iowa, November 11-13.

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STATISTICAL INFORMATION FOR OCTOBER, 1920

GARDEN ATTENDANCE:

Total number of visitors.....19,658

PLANT ACCESSIONS:

Total number of plants received as gifts..... 4
Total number of plants received in exchange..... 28

PLANT DISTRIBUTION:

Plants distributed in exchange..... 5

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 44
Total number of books and pamphlets donated..... 186

HERBARIUM ACCESSIONS:

By Purchase—

Miss Marie Gocker—Plants of Cameroun, West Africa.. 63

By Gift—

W. K. Bixby—*Rhytisma acerinum* from Lake George, N. Y. 1
T. S. Brandegee—Plants of Mexico..... 2
Bureau of Plant Industry, Washington, D. C.—Duplicates of fungi from the Langlois Herbarium..... 53
Carlos E. Chardon—Fungi of Ithaca, N. Y., and Porto Rico 10
Mrs. Sarah Cotton—Cultivated specimen of *Paulownia tomentosa* Steudl 1
Mrs. Dickerson—*Martynia luisiana* Mill..... 1
J. A. Drushel—Plants of the United States..... 27
F. P. McWhorter—Fungi from various localities..... 4
Prof. L. H. Pammel—Cultivated specimen of *Ampelopsis dissecta* Carr. from Burlington, Iowa..... 1
Charles E. Prunty—*Abutilon Theophrasti* Medic. from Missouri 1
Dr. H. von Schrenk—*Lentinus lepideus* from Montana.. 1
J. N. Watson—*Pholiota destruens* from St. Louis, Mo.... 1
J. R. Winston—*Corticium*, parasitic on *Citrus*..... 1

By Exchange—

New York Botanical Garden—Specimens of the Boraginaceae, collected by Dr. F. W. Pennell in Colombia and in eastern United States..... 58

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ST. LOUIS, MO.
1920

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Bishop of the Diocese of Missouri.

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To
HENRY SHAW,
TESTIMONIAL
OF RESPECT AND GRATITUDE,
BY THE
MERCHANTS EXCHANGE OF ST. LOUIS,
December 1878
Resolved, That in the creation of TOWER GROVE PARK, by the donation to the CITY of the valuable lands composing it, in the recent gift of the magnificent bronze statues of SHAKESPEARE and HUMBOLDT, with their pedestals and retiros for the adornment of same, and in the establishment of the MISSOURI BOTANICAL GARDENS with their MUSEUM, CONSERVATORIES and the most remarkable collection in this country of the flora of all climes, MR. SHAW has materially aided the reputation and growth of ST. LOUIS, and at the same time created delightful and permanent pleasure-resorts for our citizens, in which the influence of nature and art is combined for the advancement of that general taste and culture without which there is no genuine civilization.
Resolved, That in the devotion of a private fortune, acquired during an honorable business career in this CITY to the benefit of the public and the admirable mode selected to carry out his benevolent designs by which the pleasure and profit of all citizens are permanently secured together with the adornment of the CITY and the creation of those features of local interest which are always important elements in civic progress, MR. SHAW has made himself the BENEFACTOR of the PEOPLE, reflected honor on the city of his home, endeared his name to its present and future population and is entitled to the earnest gratitude of all classes of society.
Resolved, That as merchants and business men of the CITY OF ST. LOUIS, it is especially incumbent upon us, and we esteem it a most pleasant duty to acknowledge the benefits bestowed upon the CITY and its citizens by one so long and intimately identified with the mercantile interests of the CITY. Although now retired from active business, he worthily represents the spirit and liberality which should characterize the merchants of a metropolis representative of western civilization, and throughout a useful and industrious career has evinced an active interest in the growth of the CITY which he has greatly aided. It is peculiarly gratifying to the members of this EXCHANGE that a citizen who is among the oldest of our merchants should have achieved the illustrious distinction of BENEFITTING ALL CLASSES OF THE PEOPLE and furnishing an impressive example of individual honor and rectitude linked with the most exalted and philanthropic purposes.
Resolved, That the members of the MERCHANTS EXCHANGE in view of the facts herein stated, and in accordance with the universal sentiment of the people of ST. LOUIS, hereby tender to HENRY SHAW their deep and heartfelt acknowledgement and thanks for his public spirit and noble generosity. No other return than words of gratitude and respect is now appropriate or possible, but their significance is not limited to the present time so long as his gifts to the CITY endure and there are people to enjoy them, his name will be cherished in the public heart and his memory will bloom in the beauties of the park and gardens which he created for the enjoyment of all.
ORDERED, That these resolutions be spread upon the records of this body, and that when suitably engrossed, a committee consisting of the President and Directors of the Exchange and twenty citizens, to be designated by the President, shall formally present them to MR. SHAW.

REPRODUCTION OF TESTIMONIAL TO HENRY SHAW BY THE MERCHANTS EXCHANGE OF ST. LOUIS.

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Missouri Botanical Garden Bulletin

Vol. VIII St. Louis, Mo., December, 1920 No. 10.

AN EARLY APPRECIATION OF HENRY SHAW BY THE ST. LOUIS CHAMBER OF COMMERCE

The following quotation from the Fourth Annual Report of the St. Louis Chamber of Commerce, for the year 1859, is of considerable interest from an historical standpoint, since it shows how definitely, even at this early date, Mr. Shaw had formulated the scope and activities of the Missouri Botanical Garden. Twenty years later, the Merchants Exchange of St. Louis, in a meeting assembled in the hall of the Exchange, adopted a set of resolutions in which they attempted to express their respect and gratitude to Mr. Shaw for his donation of Tower Grove Park, with its bronze statues, as well as for the establishment of the Missouri Botanical Garden. This testimonial, originally printed on satin, is reproduced on the opposite page (plate 15).

"As Economic Botany cannot but be peculiarly interesting to the people of this city and state, whose commerce is composed, to a great extent, of vegetable productions, it will be considered appropricte to refer in this report to a munificent bestowment to the city by MR. HENRY SHAW of a Botanic Garden, with all the appliances and endowments requisite to render such an enterprise efficient and permanent—the equal if not the superior of any similar establishment in the United States. The land which he intends to donate for the purpose lies only three and a half miles from the Court House, and comprises six hundred acres. At one point fifteen acres front on Grand Avenue, the boundary line of the city on the west, from which fact some idea may be formed of the value of the tract. The total of the gift may be safely estimated at one million dollars. For several years past the work has been steadily progressing, and at this time shows such a near finish, as fully to develop the liberal and enlightened design of the donor. The work of the year just closed was the erection of a Museum and Library, of fine architectural design and workmanship, at a cost of $20,000. The garden proper, with an

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area of ten acres (which is ample for the purposes intended) is surrounded by a wall of the best masonry, the main entrance to which is by a gate of beautiful design and massive construction. The whole of this area is thoroughly underdrained at a heavy expense. Leading from the gate through the lands of the donation, will be a broad avenue (already designated as Floral Avenue) one mile in extent and sixty feet in width, lined on either side with ornamental trees, which will prove, no doubt, one of the most attractive thoroughfares in or near the city. The gateway includes rooms for the keeper, and retiring rooms for visitors. The conservatory in the garden is already finished, and combines all requisite advantages, such only as a cultivated judgment and taste, assisted by rare opportunities of observation in other countries, could have planned or suggested.

"During the present year it is the intention of Mr. Shaw to erect a row of plant houses near the middle of the garden, which will constitute an additional feature of great beauty. The central one of these will be eighty by forty feet in dimensions, to be termed the Pavilion, constructed of glass and iron columns upon stone arches, after a good style. Adjoining the garden on the north, and connected with it by two arched openings, is the Fruticetum. Six acres, well enclosed and trenched, are dedicated to the improvement and propagation of such fruits as best suit the climate of Missouri. West of the Garden the Arboretum is located, containing twenty-five acres, and here the stately and beautiful trees of our own forests, as well as those of other lands adapted to the climate, are intended to find a place. Already several fine specimens from California, Europe, Asia, and Africa have been planted, and are flourishing finely. The walks throughout are laid of the best material for the purpose. The present elegant residence, known as Tower Grove, will be reserved for the Curator, and for the meetings of the Trustees, to whom the entire charge of the Garden will be ultimately entrusted. The Curator will be a man of highly scientific and practical ability, thoroughly versed in all that pertains to the science and art of Botany and Horticulture.

"Fifty acres, it will be observed, are thus occupied. The great body of the land, comprising some 500 acres, will be leased in small tracts, the rents from which will afford a large revenue for the support of the institution. Lying contiguous to the city, this land will be eagerly sought for gardening purposes, and furnished with comfortable and tasty cottages (ten of which have already been erected), we presume the

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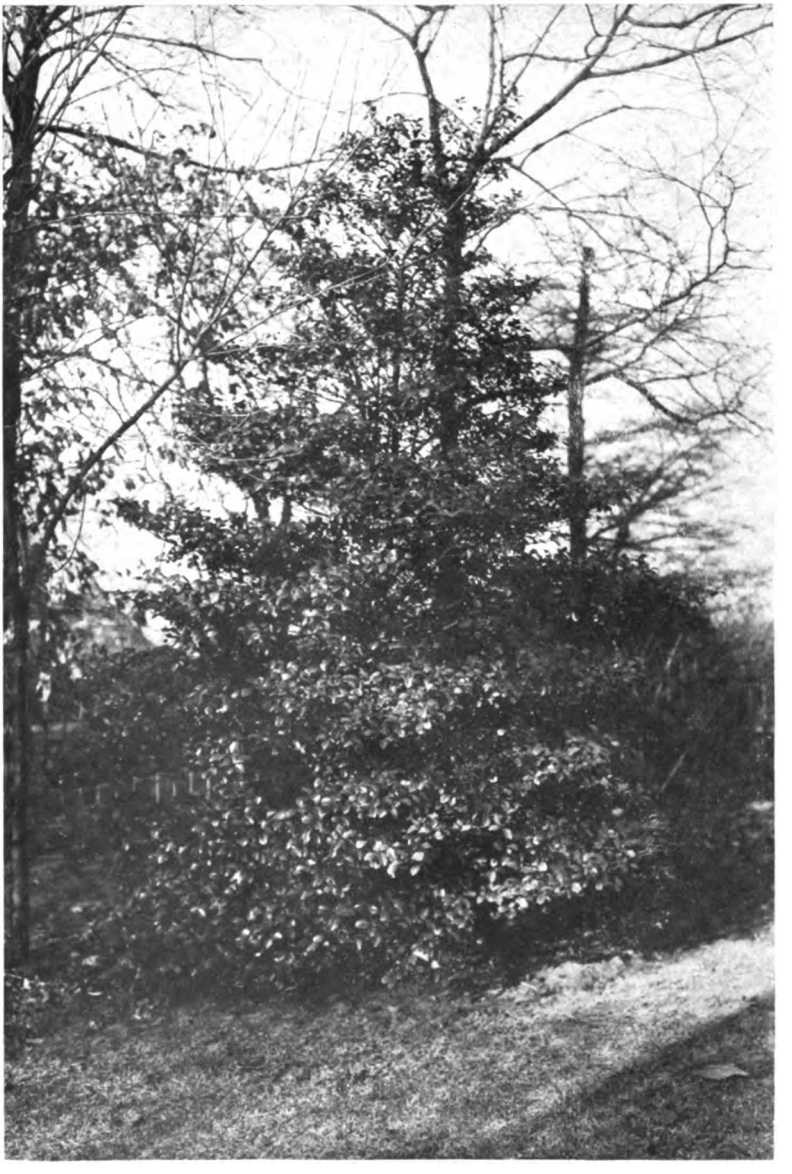

AMERICAN HOLLY TREE AT THE GARDEN.

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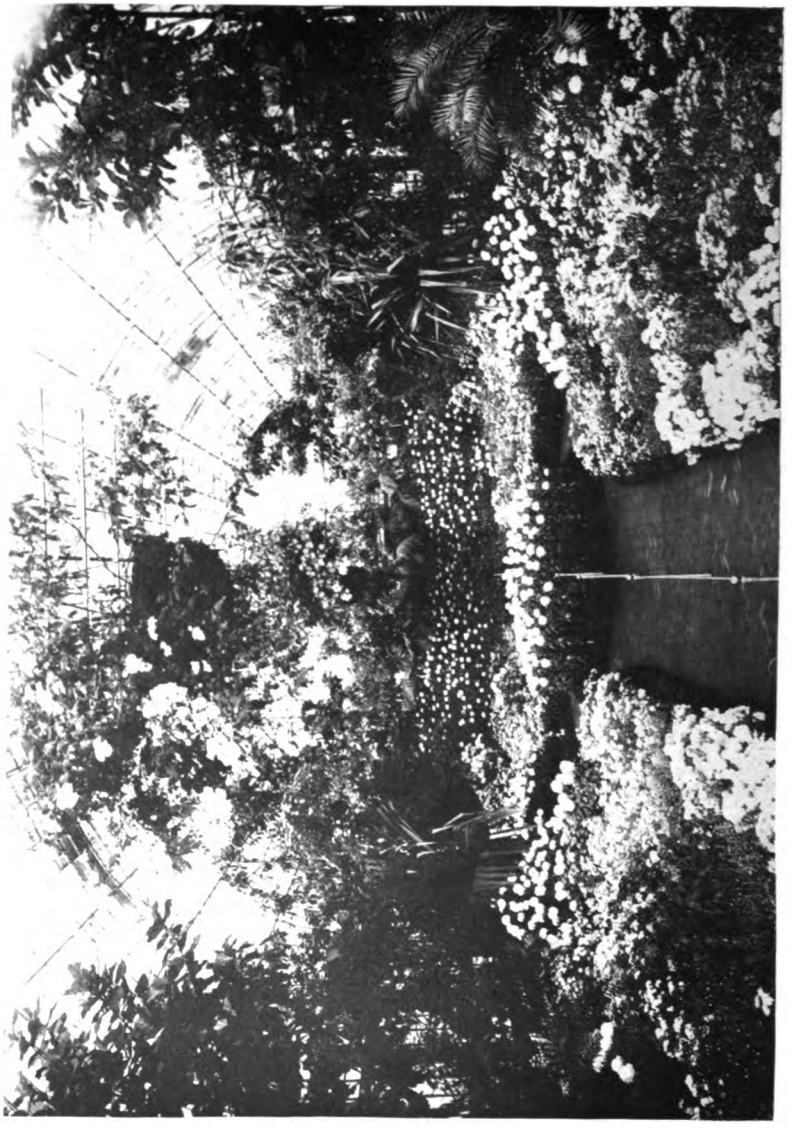

VIEW OF 1920 CHRYSANTHEMUM SHOW FROM BALCONY OF FLORAL DISPLAY HOUSE.

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rents will prove amply sufficient for the object, even on the liberal scale projected. The monuments of the liberality of individual citizens are numerous in our midst—they are dedicated to moral, educational, benevolent, and artistic purposes, and not only beautify, enrich, and ennoble the city, but exhibit an attachment to her interests and a pride in her prosperity that insure the fulfillment of the great destiny to which her past and present progress points."

THE AMERICAN HOLLY FOR ST. LOUIS

Of the many evergreens that dominated the Garden flora of former days, the holly is the only representative genus that has withstood the smoky atmosphere of St. Louis. The main garden still retains the original groups and individual specimens planted by Mr. Shaw, and while the foliage and berries are darker than plants grown in the country, due to discoloration by smoke, the trees are in a remarkably healthy condition. For a city evergreen the holly is therefore recommended above all other evergreens on account of its smoke-resisting quality (see plate 16, also plate 1 in January, 1920, BULLETIN).

The American holly, *Ilex opaca,* is a slow-growing plant found in varied kinds of soil. In the Northern and Southern states the largest specimens are found in poor, sandy loam. In the woods of Massachusetts they are abundant on southern slopes densely covered with deciduous trees, the low branches of which protect the hollies from exposure. In the South the plants are stronger and mature into specimen trees much quicker than in the North, and it is from this source that the Christmas supply of holly is generally obtained.

When selecting hollies for planting in the garden the fact should be borne in mind that they are generally dioecious in habit, that is, the sexes are on separate trees. It is therefore necessary that the male and female trees be planted close together to allow pollination by action of either wind or insects, otherwise there will be an absence of the ornamental berries. As hollies are slow-growing trees, large specimens should be obtained if immediate effect is desired. These subject themselves readily to transplanting providing a few precautions are followed. The best time to remove them is in the fall just before the ripening of the wood, or in the spring just before the appearance of the new wood, the latter perhaps being the best owing to the lateness of our falls. The essential factor at the time of transplanting is the defoliation, and fully two-thirds of the leaves should be removed to reduce

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transpiration. The many fibrous roots will allow a large ball to be dug commensurate to the size of the plant removed (see December, 1917, number of the BULLETIN).

The English and the American holly are very similar. Both have spiny leaves, but the English holly, *Ilex aquifolium*, has deeper spaces between the spines and is a denser-leaved specimen. Prior to the government restriction of importing plants with soil attached, the English variety was imported by the thousands in the form of potted plants and sold by the florists during the Christmas season.

No other plant, except the mistletoe, is so much associated with Christmas as the holly. The Druids gave the holly a place of honor in their Yuletide ceremonies, but even antedating the Christmas day of England the holly was used in festivities to denote the turning of the sun. The bright red berries make their appearance in September and often persist until March or April. The brilliant fruit in contrast with the dark green foliage makes the plant an effective floral decoration.

CHRYSANTHEMUM SHOW FOR 1920

Due to the favorable weather for keeping flowers the annual chrysanthemum show was maintained for six weeks in 1920. The exhibition included two thousand bush plants in variety of color and size ranging from the original single-flowered yellow *C. indicum* to the large double-flowered white "Josephine Foley." The single-stemmed types terminating in mop-like blooms measuring 10-12 inches in diameter numbered over 1800 plants. The "Turner" type, a light yellow variety, dominated the show by being concentrated in a single central bed. On account of their incurved petals and their cream color they were much admired, especially by the feminine visitors who referred to them as "cream puff" chrysanthemums. In contrast to this type was the tiny yellow pompon called "Baby," with flowers half an inch in diameter.

Among the novelties was a collection of Japanese freak chrysanthemums shown for the first time in St. Louis. The most striking of these was "Tachibana," a large spider-like flower with yellow thread, or filiform, pendant petals. A large grafted plant was exhibited showing twelve distinct varieties of flowers upon a single plant. For this experiment the shoots were detached in the early stage, about June, and then grafted upon the parent plant. Another new feature of the 1920 show was the introduction of hanging baskets. These specimens were suspended from the roof overhanging

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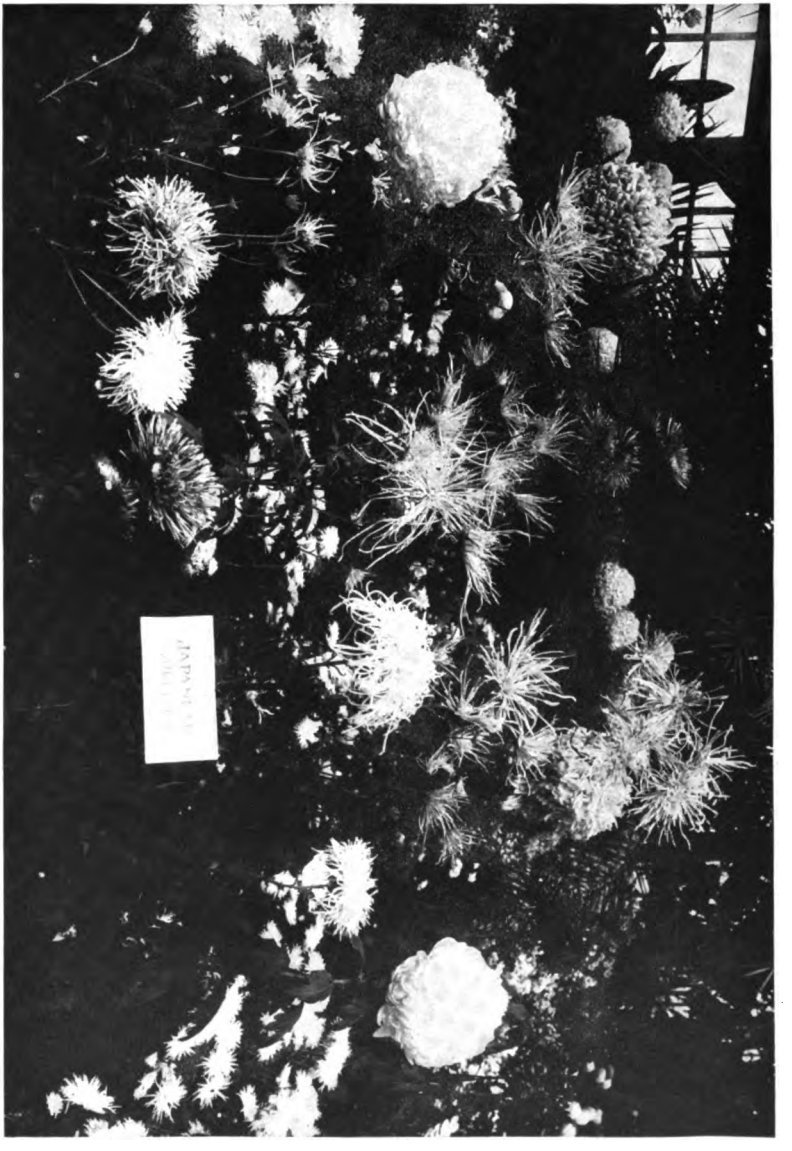

JAPANESE ODDITIES AT CHRYSANTHEMUM SHOW.

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SUNDAY CROWD AT CHRYSANTHEMUM SHOW.

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the walks and added a finish to the display which it has not heretofore been possible to obtain. For this manner of cultivation the varieties with pendant growth were selected, those best adapted being "Anna," a single white, "Cosmos," single pink, and a single yellow somewhat suggesting *C. indicum*. The plants were grown in the baskets from the cutting, or early rooting, stage, in April, to the flowering period.

The largest November attendance, excluding the World's Fair period, was recorded while this show was on, the total for the month being over 93,000. The maximum Sunday attendance was recorded on November 21, when 18,000 people passed through the floral display house between 1 and 5 P. M. The line of visitors was continuous from the flower house to the east end of the rose garden.

The show was discontinued November 30, and the flowers were distributed to the hospitals through the Book and Flower Guild. The total number of flowers given away amounted to over 40,000. Over twenty-five local hospitals received flowers, the City Hospital receiving the maximum of 7,000.

NATIVE PLANTS SUITABLE FOR THE GARDENS OF MISSOURI AND ADJOINING STATES

XIII. NATIVE TREES AND SHRUBS FOR UNFAVORABLE AND SMOKY CITY CONDITIONS

The smoky atmosphere of manufacturing cities, such as St. Louis, is very injurious to trees and shrubs. Many species will not stand these conditions at all, particularly the conifers and other evergreen plants which do not discard their leaves annually.

Among the conifers the pines will survive longer than others, and among the broad-leaved evergreen trees, the holly, *Ilex opaca*, will grow quite well in moderately smoky conditions. Conifers are, however, not recommended to be planted extensively in manufacturing cities where bituminous coal is used as fuel. Fortunately some deciduous trees and shrubs will thrive in a smoky atmosphere, as indicated by the following list of native material:

TREES

Botanical name	Common name
1. POOR SOIL AND VERY SMOKY ATMOSPHERE	
Maclura pomifera	Osage orange
Morus rubra	Red mulberry
Platanus occidentalis	Buttonwood
Populus deltoides	Cottonwood
Robinia Pseudacacia	Black locust

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Botanical name	Common name
2. MEDIUM CONDITIONS	
Acer saccharinum	Soft or sugar maple
Catalpa bignonioides	Indian bean
Catalpa speciosa	Western catalpa
Fraxinus americana	American or white ash
Gleditsia triacanthos	Honey locust
Gymnocladus canadensis	Kentucky coffee tree
Liquidambar Styraciflua	Sweet gum
Liriodendron Tulipifera	Tulip tree
Populus tremuloides	American aspen
Salix species	Willows
Ulmus americana	American elm
Ulmus fulva	Slippery elm
Ulmus alata	Winged elm
3. MOST FAVORABLE CONDITIONS OF SMOKY CITY	
Acer saccharum	Sugar maple
Betula papyrifera	American white birch
Betula nigra	River birch
Celtis occidentalis	Hackberry
Cercis canadensis	Red-bud
Chionanthus virginica	White fringe tree
Cornus florida	Flowering dogwood
Magnolia acuminata	Cucumber tree
Magnolia glauca	Sweet bay
Magnolia tripetala	Umbrella tree
Pyrus americana	American crab-apple
Pyrus ioensis	Western crab-apple
Quercus alba	White oak
Quercus macrocarpa	Bur oak
Quercus palustris	Pin oak
Quercus rubra	Red oak
Tilia americana	Basswood

SHRUBS

Botanical name	Common name
1. VERY SMOKY CONDITIONS	
Amorpha fruticosa	False indigo
Aralia spinosa	Hercules' club
Cornus stolonifera	Red Osier dogwood
Lycium vulgare	Matrimony vine
Philadelphus coronarius	Mock orange
Philadelphus grandiflorus	Large-flowering mock orange
Philadelphus inodorus	Scentless mock orange
Physocarpus opulifolius	Ninebark
Rhus glabra	Smooth sumac
Sambucus canadensis	Elder
Viburnum Opulus	High-bush cranberry

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Botanical name	Common name
2. LESS SMOKY CITY CONDITIONS	
Baccharis halimifolia	Groundsel bush
Calycanthus floridus	Strawberry bush
Cephalanthus occidentalis	Button-bush
Cornus alternifolia	Alternate-leaved dogwood
Cornus Amomum	Silky cornel
Cornus paniculata	Gray cornel
Halesia tetraptera	Silver-bell
Rhus copallina	Dwarf sumac
Rhus typhina	Staghorn sumac
Robinia hispida	Rose acacia
Rosa setigera	Prairie rose
Spiraea salicifolia var. *alba*	Willow-leaved spiraea
Spiraea Douglasii	Douglas' spiraea

XIV. NATIVE PLANTS FOR GROUND COVERS

Low, compact plants which will spread sufficiently to cover the ground are often useful in the planting of gardens. This class of planting material is extensively used in the Eastern states to cover embankments, terraces, bare edges of shrubbery plantations, thereby connecting them with the lawn, and under deep-rooting trees in place of grass. The species adapted for this purpose, when we exclude exotic materials, are not numerous but sufficient for a variety of uses. Two species, *Lysimachia Nummularia* and *Vinca minor*, are not native but are so generally found escaped from cultivation that they may almost be regarded as indigenous. Clay loam is the preferred soil condition for plants of this type.

Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom	Remarks
Achillea Millefolium	Yarrow	1-3′	White	June-Oct.	If closely cut forms dense mat.
Achillea Millefolium rubrum	Yarrow	1-3′	Red	June-Oct.	If closely cut forms dense mat.
Achillea Millefolium roseum	Yarrow	1-3′	Purple	June-Oct.	If closely cut forms dense mat.
Convallaria majalis	Lily-of-the-valley	6-8″	White	April-May	Foliage dies early.
Lysimachia Nummularia	Moneywort	2-4″	Yellow	June-Aug.	Much used on terraces.
Malva rotundifolia	Dwarf mallow	6-8″	Blue	May	
Potentilla canadensis	Five-finger		Yellow	April-Aug.	Prostrate, long runners.
Sedum pulchellum	Widow's cross	6-12″	Rose-purple	May-July	
Vinca minor	Periwinkle	4-6″	Blue	April-May	Used for grave covers.

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Botanical name	Common name	Approx. height	Color of flowers	Approx. time of bloom	Remarks
Viola striata	Violet	6-12"	White	April-May	Prefers a moist situation.
Waldsteinia fragarioides	Barren strawberry	Creeping	Yellow	May	Prefers dry shaded situations.

This concludes the series on "Native Plants Suitable for Missouri and Adjoining States." A series on "Hardy Exotic Plants for Missouri and Adjoining States," is in preparation for the 1921 issues of the BULLETIN.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, has been elected president of the St. Louis Association of Gardeners.

No. 2-3 of Vol. VII of the Annals of the Missouri Botanical Garden containing the twelfth installment of the monograph on "The Thelephoraceae of North America," by Dr. E. A. Burt, has recently been issued.

The October issue of Parks and Recreation contains two articles by Mr. L. P. Jensen, Arboriculturist to the Garden, one entitled "Public Parks as Bird Protectorates," and the other "The Influence of Parks on Civilization and Conservation of Plant Life."

Dr. George T. Moore, Director of the Garden, spoke before Town and Gown, December 17, on "Some Old Herbals and the Doctrine of Signatures." Some of the rare volumes of herbals in the Garden's unique collection were shown in connection with the lecture.

Dr. B. M. Duggar, Physiologist to the Garden, gave an illustrated lecture before the St. Louis Natural History Museum Association at the Central Public Library, December 15, on "Native Mushrooms and Their Habitat," and on December 16, he spoke before the St. Louis Garden Club on "The History of a Mushroom Bed and Mushroom Production."

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STATISTICAL INFORMATION FOR NOVEMBER, 1920

GARDEN ATTENDANCE:
Total number of visitors..... 93,389

PLANT ACCESSIONS:
Total number of plants and seeds received as gifts..... 5,137

PLANT DISTRIBUTION:
Plants distributed in exchange..... 10

LIBRARY ACCESSIONS:
Total number of books and pamphlets bought..... 29
Total number of books and pamphlets donated..... 174

HERBARIUM ACCESSIONS:

By Purchase—
Willard N. Clute—Plants of the Painted Desert, Arizona 108
W. S. Hammond—Private herbarium of the late E. W. Hammond, plants of Oregon, estimated at 700 specimens 700

By Gift—
Ira W. Clokey—Specimens of *Senecio* from Colorado.... 2
Prof. W. C. Coker—*Solenia pariaeformis* from North Carolina 1
F. P. McWhorter—Fungi about St. Louis..... 9
Miss Margaret Montgomery—*Callicarpa americana* L. from Mississippi 1
Dr. F. L. Stevens—Fungi of Porto Rico, including cotypes of 11 species 21

By Field Work—
E. B. Payson—Fungi of Wyoming and Idaho..... 9

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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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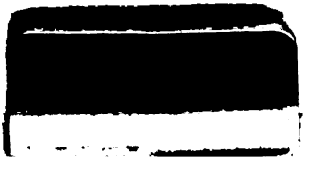

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